DKTCOMEGA
796xx Series User Guide

DKTCOMEGA

introduction

This is the user guide for the DKTCOMEGA 796xx Series CPE.

No CATV	With CATV	Description
79601	79631	4 x 10/100/1000 Base-T LAN with 100/1000 Base-Bx WAN uplink
79602	79632	4x 10/100/1000 Base-T LAN with SFP cage
79603	79633	4x 10/100/1000 Base-T LAN with 100/1000 Base-Bx WAN uplink + 2x VoIP FXS
79604	79634	4x 10/100/1000 Base-T LAN with SFP uplink + 2x VoIP FXS
79611	79641	8x 10/100/1000 Base-T LAN with 100/1000 Base-Bx WAN uplink
79612	79642	8x 10/100/1000 Base-T LAN with SFP uplink
79613	79643	8x 10/100/1000 Base-T LAN with 100/1000 Base-Bx WAN uplink + 2x VoIP FXS
79614	79644	8x 10/100/1000 Base-T LAN with SFP uplink + 2x VoIP FXS
79615	79645	7x 10/100/1000 Base-T LAN with 100/1000 Base-Bx WAN uplink + 2x VoIP FXS + Wifi
79616	79646	7x 10/100/1000 Base-T LAN with SFP uplink + 2x VoIP FXS + Wifi
79699	n/a	Fiber Mounting Cassette

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the boot process of the cpe node

The boot process is split in two:

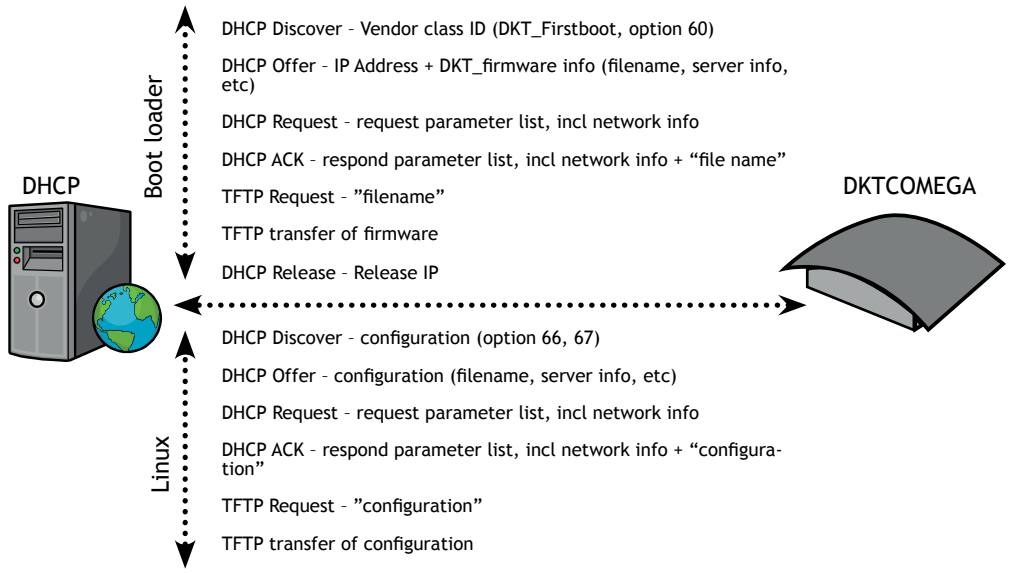
- First the node issue a dhcp request with dhcp option 60 set to <file name>vx_xx (where x_xx is the version number of the firmware).

-Afterwards the node start it's operation system (OS). The OS also issue a dhcp request, with dhcp option 60 set to the version of the software.
When a new node is unpacked it doesn't contain any firmware, and before it can be used in must be updated with the latest revision. This mean that when the node is installed at the customer premise, it will be required to remotely update with firmware, before it will be working. It is highly recommended to visit www.dktcomega.com -> support -> firmware for latest boot loader and firmware revision.
The managed node depends on DHCP negotiation. Through this negotiation the firmware ID of the managed node is exchanged for a configuration file. The DHCP server hands out the configuration file depending on the firmware ID.

Bootstrap (Part of boot loader).
A small piece of code that is able to setup critical CPU specific registers such as CPU clock, flash interface and SDRAM timing. The bootstrap code is automatically loaded by the CPU into internal RAM of the CPU and executed. Bootstrap loads a larger general boot-loader; U-boot.
U-boot (Part of boot loader).
This is a larger chunk of boot-loader software, which is able to setup network and other more complex features of the CPU. U-boot use DHCP to get network setup. U-boot is able to download firmware updates using TFTP.

Linux (Main Firmware).
This is the main software with full network support and features to use the complete hardware platform. The network is configured using DHCP, and the system configuration is downloaded using TFTP.
The first bootp/dhcp request from the device can be used to remote upgrade the firmware. If a bootfile and a bootserver is given in the bootp response then the file is downloaded via tftp and executed by the device.

The device is configured to not pass any traffic per default, so in order to pass traffic through the switch engine, the `switch --enable-lan` command must be provisioned to the device. Also telnet daemon must be started, with the use of `telnetd -l /bin/sh` command in the script


DHCP
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Boot loader
DHCP Discover - Vendor class ID (DKT_Firstboot, option 60)
DHCP Offer - IP Address + DKT_firmware info (filename, server info, etc)
DHCP Request - request parameter list, incl network info
DHCP ACK - respond parameter list, incl network info + "file name"
TFTP Request - "filename"
TFTP transfer of firmware
DHCP Release - Release IP
Linux
DHCP Discover - configuration (option 66, 67)
DHCP Offer - configuration (filename, server info, etc)
DHCP Request - request parameter list, incl network info
DHCP ACK - respond parameter list, incl network info + "configuration"
TFTP Request - "configuration"
TFTP transfer of configuration

At device start-up configuration is provisioned automatically. Firmware is provisioned by request, either at first boot or when applicable

Ensures correct device settings and automatically firmware upgrade without user interaction
Firmware and configuration are provisioned by the operator

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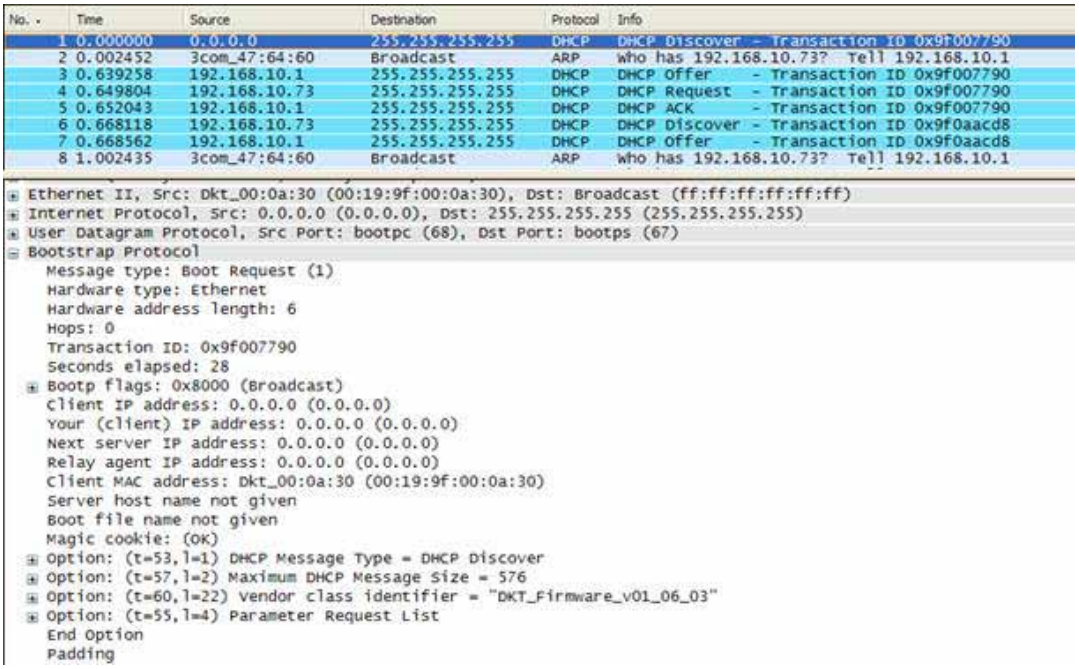
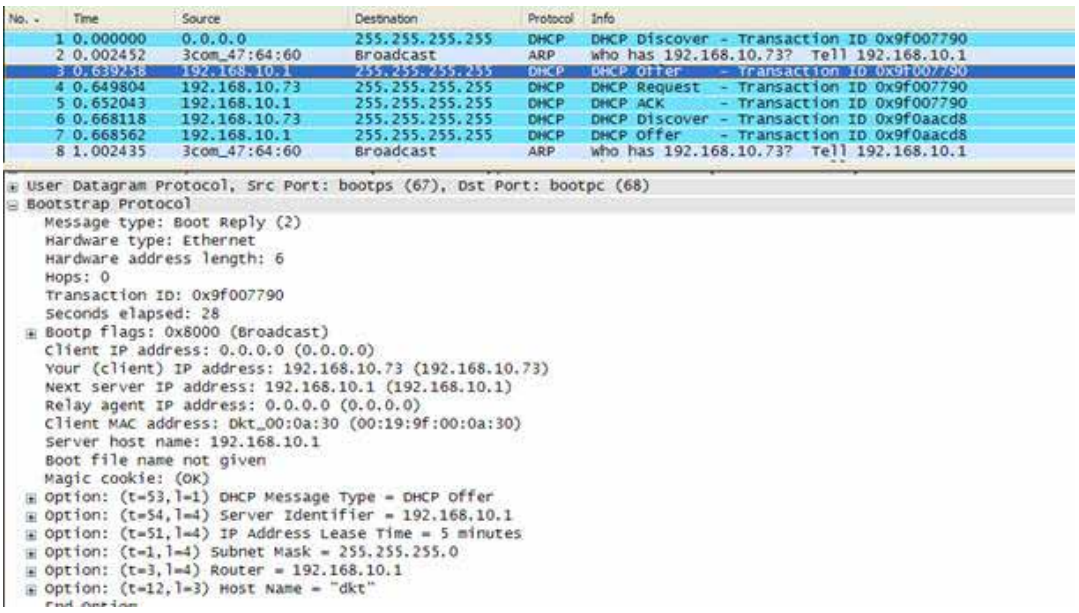
dhcp settings

The CPE requires a dhcp server connected to the fiber WAN port before power on.
Please refer to Appendix 3 – DHCP Settings for example of DHCP settings

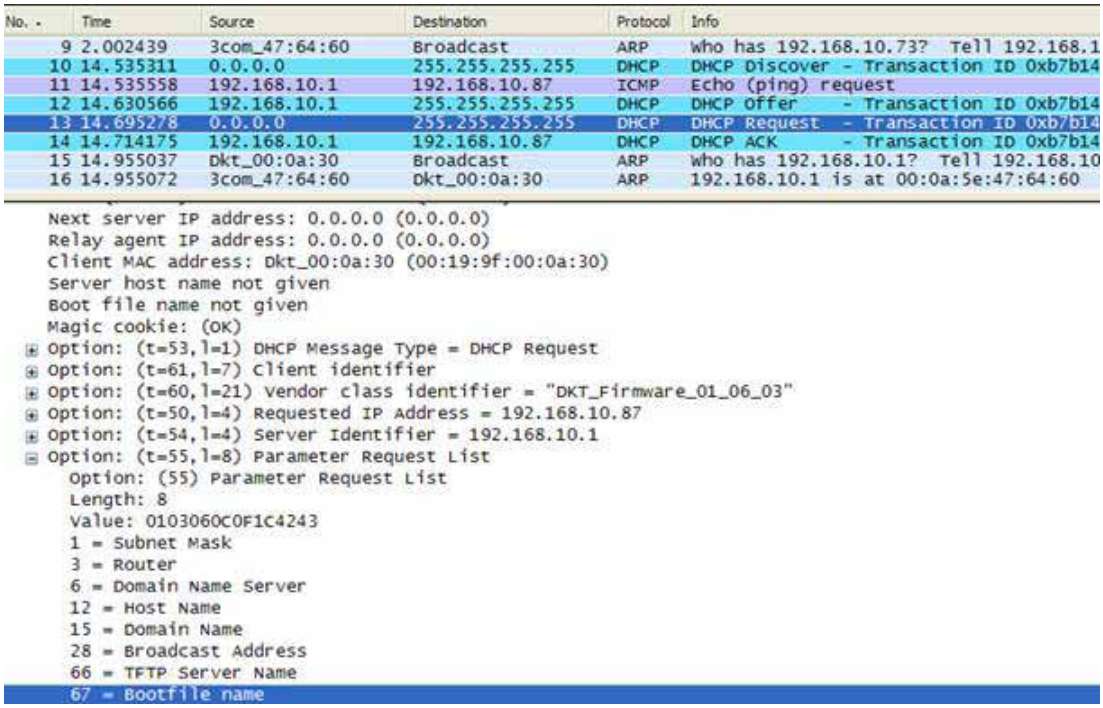
1) CPE requests in its BOOTLOADER discoverer:
Option: 53, 57, 60, 55


No. Time Source Destination Protocol Info
1 0.000000 0.0.0.0 255.255.255.255 DHCP DHCP Discover - Transaction ID 0x9f007790
2 0.002452 3com_47:64:60 Broadcast ARP who has 192.168.10.73? Tell 192.168.10.1
3 0.639258 192.168.10.1 255.255.255.255 DHCP DHCP Offer - Transaction ID 0x9f007790
4 0.649804 192.168.10.73 255.255.255.255 DHCP DHCP Request - Transaction ID 0x9f007790
5 0.652043 192.168.10.1 255.255.255.255 DHCP DHCP ACK - Transaction ID 0x9f007790
6 0.668118 192.168.10.73 255.255.255.255 DHCP DHCP Discover - Transaction ID 0x9f0aacd8
7 0.668562 192.168.10.1 255.255.255.255 DHCP DHCP Offer - Transaction ID 0x9f0aacd8
8 1.002435 3com_47:64:60 Broadcast ARP who has 192.168.10.73? Tell 192.168.10.1
Ethernet II, Src: Dkt_00:0a:30 (00:19:9f:00:0a:30), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Internet Protocol, Src: 0.0.0.0 (0.0.0.0), Dst: 255.255.255.255 (255.255.255.255)
User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)
Bootstrap Protocol
Message type: Boot Request (1)
Hardware type: Ethernet
Hardware address length: 6
Hops: 0
Transaction ID: 0x9f007790
Seconds elapsed: 28
Bootp flags: 0x8000 (Broadcast)
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 0.0.0.0 (0.0.0.0)
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 0.0.0.0 (0.0.0.0)
Client MAC address: Dkt_00:0a:30 (00:19:9f:00:0a:30)
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Discover
Option: (t=57,l=2) Maximum DHCP Message Size = 576
Option: (t=60,l=22) Vendor class identifier = "DKT_Firmware_v01_06_03"
Option: (t=55,l=4) Parameter Request List
End Option
Padding

2) DHCP Server offers in it responses:
Option: 53, 54, 51, 1, 3


No. Time Source Destination Protocol Info
1 0.000000 0.0.0.0 255.255.255.255 DHCP DHCP Discover - Transaction ID 0x9f007790
2 0.002452 3com_47:64:60 Broadcast ARP who has 192.168.10.73? Tell 192.168.10.1
3 0.639258 192.168.10.1 255.255.255.255 DHCP DHCP Offer - Transaction ID 0x9f007790
4 0.649804 192.168.10.73 255.255.255.255 DHCP DHCP Request - Transaction ID 0x9f007790
5 0.652043 192.168.10.1 255.255.255.255 DHCP DHCP ACK - Transaction ID 0x9f007790
6 0.668118 192.168.10.73 255.255.255.255 DHCP DHCP Discover - Transaction ID 0x9f0aacd8
7 0.668562 192.168.10.1 255.255.255.255 DHCP DHCP Offer - Transaction ID 0x9f0aacd8
8 1.002435 3com_47:64:60 Broadcast ARP who has 192.168.10.73? Tell 192.168.10.1
User Datagram Protocol, Src Port: bootps (67), Dst Port: bootpc (68)
Bootstrap Protocol
Message type: Boot Reply (2)
Hardware type: Ethernet
Hardware address length: 6
Hops: 0
Transaction ID: 0x9f007790
Seconds elapsed: 28
Bootp flags: 0x8000 (Broadcast)
Client IP address: 0.0.0.0 (0.0.0.0)
Your (client) IP address: 192.168.10.73 (192.168.10.73)
Next server IP address: 192.168.10.1 (192.168.10.1)
Relay agent IP address: 0.0.0.0 (0.0.0.0)
Client MAC address: Dkt_00:0a:30 (00:19:9f:00:0a:30)
Server host name: 192.168.10.1
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Offer
Option: (t=54,l=4) Server Identifier = 192.168.10.1
Option: (t=51,l=4) IP Address Lease Time = 5 minutes
Option: (t=1,l=4) Subnet Mask = 255.255.255.0
Option: (t=3,l=4) Router = 192.168.10.1
Option: (t=12,l=3) Host Name = "dkt"

3) CPE requests in its LINUX Boot-up process, where configuration file is requested:
Option: 53, 61, 60, 50, 54, 55, 1, 3, 28, 66, 67


No. - Time Source Destination Protocol Info
9 2.002439 3com_47:64:60 Broadcast ARP Who has 192.168.10.73? Tell 192.168.1
10 14.535311 0.0.0.0 255.255.255.255 DHCP DHCP Discover - Transaction ID 0xb7b14
11 14.535558 192.168.10.1 192.168.10.87 ICMP Echo (ping) request
12 14.630566 192.168.10.1 255.255.255.255 DHCP DHCP Offer - Transaction ID 0xb7b14
13 14.695278 0.0.0.0 255.255.255.255 DHCP DHCP Request - Transaction ID 0xb7b14
14 14.714175 192.168.10.1 192.168.10.87 DHCP DHCP ACK - Transaction ID 0xb7b14
15 14.955037 Dkt_00:0a:30 Broadcast ARP Who has 192.168.10.1? Tell 192.168.10
16 14.955072 3com_47:64:60 Dkt_00:0a:30 ARP 192.168.10.1 is at 00:0a:5e:47:64:60
Next server IP address: 0.0.0.0 (0.0.0.0)
Relay agent IP address: 0.0.0.0 (0.0.0.0)
Client MAC address: Dkt_00:0a:30 (00:19:9f:00:0a:30)
Server host name not given
Boot file name not given
Magic cookie: (OK)
Option: (t=53,l=1) DHCP Message Type = DHCP Request
Option: (t=61,l=7) Client identifier
Option: (t=60,l=21) Vendor class identifier = "DKT_Firmware_01_06_03"
Option: (t=50,l=4) Requested IP Address = 192.168.10.87
Option: (t=54,l=4) Server Identifier = 192.168.10.1
Option: (t=55,l=8) Parameter Request List
Option: (55) Parameter Request List
Length: 8
Value: 0103060C0F1C4243
1 = Subnet Mask
3 = Router
6 = Domain Name Server
12 = Host Name
15 = Domain Name
28 = Broadcast Address
66 = TFTP Server Name
67 = Bootfile name

custom configuration

When the OS issue a dhcp request a filename of a configuration file can be sent to the node. This configuration file is then downloaded by tftp during the boot process and issued instead of the default configuration. In this way it is possible to persist settings for each customer (by mapping the hardware address of the node and the customer number).

The server and the filename of the configuration file should be sent in respective tftp-server-name (option 66) and bootfile-name (option 67) from the dhcp server. Notice these options are different from the bootfile/bootserver used in the bootp response.

If it is not feasible that the dhcp server distinguish the customer's configurations base on the hardware address an alternative method can be used. The dhcp server sends out the name of a generic configuration. This configuration can then include instruction to the node of fetching a node specific configure by tftp where the requested filename is a combination of the node hardware address.
In the generic configuration script, which is common for all devices and that will provisioned during boot up, the following instructions can be inserted:

```
source /etc/dhcp.vars
export WAN_MACADDR=$(ip addr show dev eth0 | grep "ether" | cut -d " " -f6
| tr -d :)
tftp -g -r my_conf_$WAN_MACADDR -l /tmp/config.sh $TFTP_SERVER
save_configuration
source /tmp/config.sh
```

An example of a configuration file could be the following:

```
######################################################################
# DKT configuration
# Firmware version: 02_05
######################################################################
switch --enable-lan # enable LAN ports
# VLAN SETTINGS FOR WAN PORT
switch --set-port-802dot1q-mode=0:2
# Sets the WAN port in check mode, allows untagged on ingress if VID (incl
default) is present in VTU
switch --set-port-default-vid=0:102
# Default VLAN for WAN port
switch --add-vtu-entry 102:2:1:1:1:1:2:0
# Management VLAN, enables contact to CPU - untagged on egress
switch --set-port-802dot1q-mode=1:3
# Sets the LAN port in secure mode
switch --set-port-802dot1q-mode=2:3
# Sets the LAN port in secure mode
switch --set-port-802dot1q-mode=3:3
# Sets the LAN port in secure mode
switch --set-port-802dot1q-mode=4:3
# Sets the LAN port in secure mode
switch --add-vtu-entry 104:3:2:2:1:1:2:0
# put WAN and LAN port into VLAN - untagged on egress, IPTV VLAN
switch --set-port-default-vid=1:104
# Default VLAN for LAN port 1, IPTV VLAN
switch --set-port-default-vid=2:104
# Default VLAN for LAN port 2, IPTV VLAN
switch --add-vtu-entry 106:3:1:1:2:1:2:0
# put WAN and LAN port into VLAN - untagged on egress, DATA VLAN
switch --set-port-default-vid=3:106
# Default VLAN for LAN port 3, DATA VLAN
switch --add-vtu-entry 105:3:1:1:1:2:2:0
# put WAN and LAN port into VLAN - untagged on egress, VoIP VLAN
switch --set-port-default-vid=4:105
# Default VLAN for LAN port 4, VoIP VLAN
#
# QoS Settings
#Uplink rate (DATA port 3 and 4, ingress rates of 1 Mbps)
switch --set-port-ingress-rate-limit 3:0:1000:3:FC
# port=3, bucket=0, rate=1000kb/S, bytecounter=layer3,limitaction=flowcontr
ol
switch --port-map-to-pirl-bucket 4:0
# join port 4 to bucket 0. Please notice that thisfeature is NOT valid for
the Gigabit CPE
#Downlink rate (Total for WAN 2Mbps)
switch --set-port-ingress-rate-limit 0:1:2000:3:FC
# port=0(WAN), bucket=0, rate=2Mb/S, bytecounter=layer3,
limitaction=flowcontrol
#
# Turn CATV module off
switch -c 0
#
# The following command enables TELNET access from WAN
telnetd -l /bin/sh
# End of DKT configuration
######################################################################
```

device script commands

The following commands are supported in the script that will be downloaded to the CPE via TFTP during boot-up process.
This command is used to configure the switch in the unit. The command takes one or more of the following parameters, with the syntax switch --nn.

The 7960x models have 4 LAN ports, whereas 7961x models have 7/8 LAN ports. The port outline and port mapping is as follows, shown from the front:

4 port (7960x):

LAN1 1	LAN2 2	LAN3 3	LAN4 4

7 port (79615, 79616):

LAN2 2	LAN4 4	LAN6 Ext2	LAN8 Ext4
X (WiFi)	LAN3 3	LAN5 Ext1	LAN7 Ext3

8 port (79611/12/13/14):

LAN2 2	LAN4 4	LAN6 Ext2	LAN8 Ext4
LAN1 1	LAN3 3	LAN5 Ext1	LAN7 Ext3

LAN ports 5 - 8 are activated by the `-ext` command, e.g.

```
--set-port-mtu=PORT:(0|1|2), where port is 1…4, covering LAN1…4
--set-port-mtu-ext=PORT:(0|1|2), where port is 1…4, covering LAN5…8
```

Basic settings:

```
-s, --simple-switch
Setup port based VLAN for a simple switch.

-e, --enable-lan
Enables LAN ports so traffic can be switched between WAN and LAN.

-v, --version
Prints the firmware version number.

-h, --help
Prints this help text.

--set-arp-mirroring=PORT:enable
Enable/disable ARP mirroring to the CPU port, works from firmware revision
02_13 and later

--get-arp-mirroring=PORT
Get state of ARP mirroring to the CPU port, works from firmware revision 02_13
and later
```

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CATV:

```
-c, --catv=(1|0)
Turns on/off the CATV module.
```

Unicast:

```
--add-uca=PORT:aa:bb:cc:dd:ee:ff
Adds the Ethernet address statically into the ATU.

--add-uca-ext=PORT:aa:bb:cc:dd:ee:ff
Adds the Ethernet address statically into the ATU.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--del-uca=aa:bb:cc:dd:ee:ff
Removes the Ethernet address from the ATU.
--dump-atu
Dumps the current content of the ATU, Ethernet addresses and Port no.
```

Multicast:

```
--add-mca=PORT:aaa.bbb.ccc.ddd
Adds the IP multicast address statically to the ATU.

--add-mca-ext=PORT:aaa.bbb.ccc.ddd
Adds the IP multicast address statically to the ATU.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.


--del-mca=PORT:aaa.bbb.ccc.ddd
Removes the IP multicast address from the ATU.

--del-mca-ext=PORT:aaa.bbb.ccc.ddd
Removes the IP multicast address from the ATU.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--enable-port-block-unknown-multicast=PORT:(1|0)
Blocks all Ethernet frames with Destination Address not present in the ATU.

--enable-port-block-unknown-multicast-ext=PORT:(1|0)
Blocks all Ethernet frames with Destination Address not present in the ATU.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-enable-port-block-unknown-multicast=PORT
Prints the status of blocking all Ethernet frames with Destination Address not
present in the ATU.

--get-enable-port-block-unknown-multicast-ext=PORT
Prints the status of blocking all Ethernet frames with Destination Address not
present in the ATU.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--enable-port-igmp-snooping=PORT:(1|0)
Enables/disables IGMP snooping for the individual port.

--enable-port-igmp-snooping-ext=PORT:(1|0)
Enables/disables IGMP snooping for the individual port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-enable-port-igmp-snooping=PORT
Prints the status if IGMP snooping is enabled for the port.

--get-enable-port-igmp-snooping-ext=PORT
Prints the status if IGMP snooping is enabled for the port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

```
--set-port-mtu=PORT:(0|1|2)
Sets the MTU size for the port 0…5, where 0 indicates support for 1522 bytes, 1
indicates support for 2048 bytes and 2 indicates support for 10240 bytes

--set-port-mtu-ext=PORT:(0|1|2)
Sets the MTU size for the port 0…4 covering LAN port 5…8, where 0 indicates
support for 1522 bytes, 1 indicates support for 2048 bytes and 2 indicates sup-
port for 10240 bytes
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.


--get-port-mtu=PORT
Get the MTU size for the port

--get-port-mtu-ext=PORT
Get the MTU size for the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

Link status:

```
--get-port-link-status=PORT
Gets the links status of the port

--get-port-link-status-ext=PORT
Gets the links status of the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

Speed and duplex mode:

--set-port-autonegotiation=PORT:(1|0)
Enable or disable autonegotation on the port

--set-port-autonegotiation-ext=PORT:(1|0)
Enable or disable autonegotation on the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-autonegotiation=PORT
Gets the autonegotiation status of the port

--get-port-autonegotiation-ext=PORT
Gets the autonegotiation status of the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-port-speed-mode=PORT:(1000FD|1000HD|100FD|100HD|10FD|10HD|AUTO|FD|HD)
Sets the speed and duplex mode of the port

--set-port-speed-mode-ext=PORT:(1000FD|1000HD|100FD|100HD|10FD|10HD|AUTO|FD|HD)
Sets the speed and duplex mode of the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-speed-mode=PORT
Gets the speed and duplex mode of the port

--get-port-speed-mode-ext=PORT
Gets the speed and duplex mode of the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

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Flow control:

```
--enable-port-flowcontrol=PORT:(1|0)
Enables/disables flow control on the port

--enable-port-flowcontrol-ext=PORT:(1|0)
Enables/disables flow control on the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-enable-port-flowcontrol=PORT:(1|0)
Prints the status of flow control on the port

--get-enable-port-flowcontrol-ext=PORT:(1|0)
Prints the status of flow control on the port
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

Rate control:

```
--dump-pirl-buckets
Prints the status of the PIRL buckets.

--set-port-egress-rate-limit=PORT:rate
Sets the egress rate for the port. Rate is in kbps range: 0, 128..1000000 -
0=unlimited

--set-port-egress-rate-limit-ext=PORT:rate
Sets the egress rate for the port. Rate is in kbps range: 0, 128..1000000 -
0=unlimited
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-egress-rate-limit=port
Display egress rate for the port.

--get-port-egress-rate-limit-ext=port
Display egress rate for the port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-port-ingress-rate-limit=port:bucket:rate:layer:(DROP|FC)
Sets a Port Input Rate Limit(PIRL) bucket.

--set-port-ingress-rate-limit-ext=port:bucket:rate:layer:(DROP|FC)
Sets a Port Input Rate Limit(PIRL) bucket.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-ingress-rate-limit=port
Gets a list of enabled Port Input Rate Limit(PIRL) buckets.

--get-port-ingress-rate-limit-ext=port
Gets a list of enabled Port Input Rate Limit(PIRL) buckets.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--disable-pirl-bucket=port:bucket
Disables a PIRL bucket.

--disable-pirl-bucket-ext=port:bucket
Disables a PIRL bucket.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

QoS:

```
--set-port-ieee-tag-priority=PORT:(1|0)
Enables prioritized frames based on their IEEE priority tags

--set-port-ieee-tag-priority-ext=PORT:(1|0)
Enables prioritized frames based on their IEEE priority tags
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-ieee-tag-priority=PORT
Prints the status of Enable prioritized frames based on there IEEE priority
tags

--get-port-ieee-tag-prioritye-ext=PORT
Prints the status of Enable prioritized frames based on there IEEE priority
tags
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-port-ip4ip6-priority-field=PORT:(1|0)
Enables prioritized frames based on their IP4/IP6 priority fields

--set-port-ip4ip6-priority-field-ext=PORT:(1|0)
Enables prioritized frames based on their IP4/IP6 priority fields
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-ip4ip6-priority-field=PORT
Prints the status of Enable prioritized frames based on their IP4/IP6 priority
fields
--get-port-ip4ip6-priority-field-ext=PORT
Prints the status of Enable prioritized frames based on their IP4/IP6 priority
fields
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-port-map-rule=PORT:(1|0)
This makes IEEE tags to used priority to IP4/IP4 fields if both exists.

--set-port-map-rule-ext=PORT:(1|0)
This makes IEEE tags to used priority to IP4/IP4 fields if both exists.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-map-rule=PORT
Prints the status of if IEEE tags is prioritized over IP4/IP4 fields if both
exists.

--get-port-map-rule-ext=PORT
Prints the status of if IEEE tags is prioritized over IP4/IP4 fields if both
exists.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-ieee-queue-map=PRIO:QUEUE
Used to map IEEE tag priority 0-7 to internal queue 0-3.

--get-ieee-queue-map=PORT
Prints the queue of a mapped IEEE tag priority.

--get-ieee-queue-map-ext=PORT
Prints the queue of a mapped IEEE tag priority.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-ip4ip6-queue-map=PRIO:QUEUE
```

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```
Used to map IP4/IP6 priority 0-63 to internal queue 0-3.

--get-ip4ip6-queue-map=PORT
Prints gets the queue of a mapped IP4/IP6 priority.

--get-ip4ip6-queue-map-ext=PORT
Prints gets the queue of a mapped IP4/IP6 priority.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

IEEE 802.1Q VLAN:

```
--set-port-admit-only-tagged-frames=PORT:ENABLE
This will make sure that all frames received on the port is blocked unless they
are tagged with a VLAN ID.

--set-port-admit-only-tagged-frames-ext=PORT:ENABLE
This will make sure that all frames received on the port is blocked unless they
are tagged with a VLAN ID.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-admit-only-tagged-frames=PORT
Prints the status of blocking untagged frames
--get-port-admit-only-tagged-frames-ext=PORT
Prints the status of blocking untagged frames
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--add-vtu-entry=VID:WAN:LAN1:LAN2:LAN3:LAN4:CPU:NRL-ENABLE[:PRIORITY]

--add-vtu-entry=VID:WAN:LAN1:LAN2:LAN3:LAN4:CPU:LAN5:LAN6: LAN7:LAN8:NRL-
ENABLE[:PRIORITY]
Applicable to 7/8 port models only.

Modes for the ports
0=egress unmodified,       so the frames's VID tag will not be modified
1=not member,              frames belonging to the VLAN will not be present on
the port
2=egress untagged,  frames with VID tag will have this tag stripped
3=egress tagged,    frames will have the VID tag inserted
If the VID should be omitted in rate limitation, the NRL-ENABLE should be set
to 1, then PIRL bucket will be bypassed.
PRIORITY is optional parameter, a Class of Service value can be associated to
the specific VLAN. Value 0…7 is accepted. If parameters is omitted no changes
will be made to priority tag.

--del-vtu-entry=VID
Removes the VTU entry for the VID.

--dump-vtu
Dumps the VTU table

--clear-vtu
Removes all entries of the VTU.

--set-port-default-vid=PORT:VID
Sets the default VLAN ID(VID) for a port.

--set-port-default-vid-ext=PORT:VID
Sets the default VLAN ID(VID) for a port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

```
--get-port-default-vid=PORT:VID
Prints the default VLAN ID(VID) for a port.

--get-port-default-vid-ext=PORT:VID
Prints the default VLAN ID(VID) for a port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-port-force-default-vid=PORT:ENABLE
Forces the tagging of VID on all frames on the port.

--set-port-force-default-vid-ext=PORT:ENABLE
Forces the tagging of VID on all frames on the port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-force-default-vid=PORT
Gets the status of force tagging of VID on all frames on the port.

--get-port-force-default-vid-ext=PORT
Gets the status of force tagging of VID on all frames on the port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--set-port-802dot1q-mode=PORT:MODE

--set-port-802dot1q-mode-ext=PORT:MODE
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

Sets the IEEE 802.1Q mode for the ingress port.
Mode either
0=disable,   disables IEEE 802.1Q for the port, used for port based VLANs
1=fallback,  enables IEEE 802.1Q for the port, fallback mode
2=check,     enables IEEE 802.1Q for the port, check mode
3=secure,    enables IEEE 802.1Q for the port, secure mode

--get-port-802dot1q-mode=PORT

--get-port-802dot1q-mode-ext=PORT
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

Prints the 802.1Q mode for the ingress port.
Mode either
0=disable,   disables IEEE 802.1Q for the port, used for port based VLANs
1=fallback,  enables IEEE 802.1Q for the port, fallback mode
2=check,     enables IEEE 802.1Q for the port, check mode
3=secure,    enables IEEE 802.1Q for the port, secure mode
```

Port based VLAN:

```
--set-port-vlan-table=port:WAN_ENABLE:LAN1_ENABLE:LAN2_ENABLE: LAN3_
ENABLE:LAN4_ENABLE:CPU_ENABLE
Enable which ports are enabled for communication.
PORT_ENABLE is in the range 0..1

--set-port-vlan-table-ext=port:WAN_ENABLE:LAN1_ENABLE:LAN2_ENABLE: LAN3_
ENABLE:LAN4_ENABLE:CPU_ENABLE:LAN5_ENABLE:LAN6_ENABLE:LAN7_ENABLE:LAN8_ENABLE
Enable which ports are enabled for communication.
PORT_ENABLE is in the range 0..1
Applicable to 7/8 port models only.

--get-port-vlan-table=port
```

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```
Prints the port based VLAN mapping

--get-port-vlan-table=port
Prints the port based VLAN mapping
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.
```

RMON:

```
--get-rmon-histogram-mode
Sets the mode for the RMON counters.
0 = Rx only, 1 = Tx only, 2 = Sum of Rx and Tx.

--set-rmon-histogram-mode=MODE
Sets the mode for the RMON counters.
Mode must be between 0 and 2; 0 = Rx only, 1 = Tx only, 2 = Sum of Rx and Tx.

--flush-all-rmon-counters
Flushes all counters on all ports.

--flush-port-rmon-counters=PORT
Flushes all counter for a single port.

--flush-port-rmon-counters-ext=PORT
Flushes all counter for a single port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

--get-port-rmon-counters=PORT, Prints the RMON counters for a port.

--get-port-rmon-counters-ext=PORT, Prints the RMON counters for a port.
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

DHCP Option 82:

--set-port-dhcp-option82=PORT:enable[:<optional text>]

--set-port-dhcp-option82-ext=PORT:enable[:<optional text>]
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

       Enable or disable DHCP option 82 (DHCP relay agent).
        1=enable, 0=disable
The optional text will be written in the “Option82 Agent Circuit ID
Sub-option” field. If the optional text contains white space, the text must be
enclosed in “”.

--get-port-dhcp-option82=PORT

--get-port-dhcp-option82-ext=PORT
Applicable to 7/8 port models only. Port 1…4 covers LAN port 5…8.

       Is DHCP option 82 (DHCP relay agent) enabled?
        1=enable, 0=disable
        “Option82 Agent Circuit ID Sub-option” text.
```

explanation of feature settings

VLAN settings
In SECURE mode, the VID for the given frame must be contained in the VTU, and the Ingress port must be a member of the VLAN or the frame will be discarded.
In CHECK mode, the VID for the given frame must be contained in the VTU or the frame will be discarded (the frame will not be discarded if the Ingress port is not a memeber of the VLAN).
In FALLBACK mode, Frames are not discarded if their VID's are not contained in the VTU. If the frame's VID is contained in the VTU, the frame is allowed to exit only those ports that are members of the frame's VLAN; otherwise the switch 'falls back' into Port Based VLAN mode for the frame.
Egress Tagging for a member port of a Vlan has the following three choices:

1. Unmodified
2. Untagged
3. Tagged

The default configuration defines no VLAN.

The following ports can be included in the VLAN setup:
- WAN port = port <0>
- LAN port 1 = port <1>
- LAN port 2 = port <2>
- LAN port 3 = port <3>
- LAN port 4 = port <4>
- CPU port = port <5>, this is the interface between the internal switch and CPU engine (management and VoIP processor, if applicable)

For 7/8 port models:
- LAN port 5 = port Ext <1>
- LAN port 6 = port Ext <2>
- LAN port 7 = port Ext <3>
- LAN port 8 = port Ext <4>
  Each LAN port can be setup up to tagged traffic there ingress the port with a given vlan identifier. When the traffic egress the LAN port the vlan tag is removed.

The syntax for the command is:

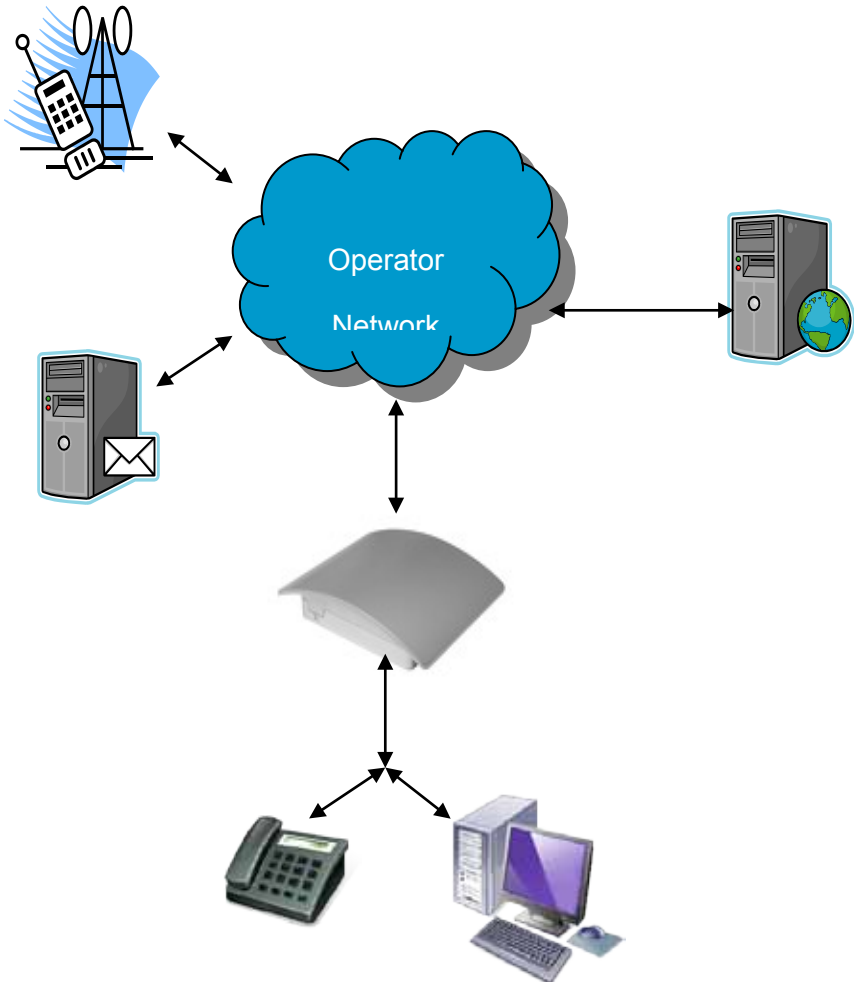
```
# VLAN SETTINGS FOR WAN PORT, WAN PORT WILL BE MEMBER OF ALL VLANS, SEE SET-
TINGS UNDER EACH VLAN DEFINITION
switch --set-port-802dot1q-mode 0:3 # WAN port is in secure mode, allows tagged
frames only
switch --add-vtu-entry 500:3:1:1:1:1:2:2:0 # puts WAN and CPU into vid 500,
THIS IS MANAGEMENT VLAN

# For 7/8 port models
switch --add-vtu-entry-ext 500:3:1:1:1:1:2::1:1:1:12:0 # puts WAN and CPU into
vid 500, THIS IS MANAGEMENT VLAN
#
# VLAN SETTINGS FOR LAN PORT 1
switch --set-port-802dot1q-mode 1:3 # LAN port 1 is secure mode, allows tagged
frames only
switch --add-vtu-entry 111:3:3:1:1:1:2:0 # puts WAN and LAN1 into vid 111, LAN1
is tagged on egress
switch --add-vtu-entry 121:3:3:1:1:1:2:0 # puts WAN and LAN1 into vid 121, LAN1
is tagged on egress
switch --add-vtu-entry 131:3:3:1:1:1:2:0 # puts WAN and LAN1 into vid 131, LAN1
is tagged on egress
switch --add-vtu-entry 141:3:3:1:1:1:2:0 # puts WAN and LAN1 into vid 141, LAN1
```

```
is tagged on egress
#switch --set-port-default-vid 1:111 # If untagged frames ingress on port 1,
place these into VLAN 111 (first VLAN)
#
# VLAN SETTINGS FOR LAN PORT 2
switch --set-port-802dot1q-mode 2:3 # LAN port 2 is secure mode, allows tagged
frames only
switch --add-vtu-entry 211:3:1:3:1:1:2:0 # puts WAN and LAN2 into vid 211, LAN2
is tagged on egress
switch --add-vtu-entry 221:3:1:3:1:1:2:0 # puts WAN and LAN2 into vid 221, LAN2
is tagged on egress
switch --add-vtu-entry 231:3:1:3:1:1:2:0 # puts WAN and LAN2 into vid 231, LAN2
is tagged on egress
switch --add-vtu-entry 241:3:1:3:1:1:2:0 # puts WAN and LAN2 into vid 241, LAN2
is tagged on egress
#switch --set-port-default-vid 2:211 # If untagged frames ingress on port 2,
place these into VLAN 211 (first VLAN)
#
# VLAN SETTINGS FOR LAN PORT 3
switch --set-port-802dot1q-mode 3:3 # LAN port 3 is secure mode, allows tagged
frames only
switch --add-vtu-entry 311:3:1:1:3:1:2:0 # puts WAN and LAN3 into vid 311, LAN3
is tagged on egress
switch --add-vtu-entry 321:3:1:1:3:1:2:0 # puts WAN and LAN3 into vid 321, LAN3
is tagged on egress
switch --add-vtu-entry 331:3:1:1:3:1:2:0 # puts WAN and LAN3 into vid 331, LAN3
is tagged on egress
switch --add-vtu-entry 341:3:1:1:3:1:2:0 # puts WAN and LAN3 into vid 341, LAN3
is tagged on egress
#switch --set-port-default-vid 3:311 # If untagged frames ingress on port 3,
place these into VLAN 311 (first VLAN)
#
# VLAN SETTINGS FOR LAN PORT 4, DUMMY VLAN
switch --set-port-802dot1q-mode 4:3 # LAN port 4 is secure mode, allows tagged
frames only

# VLAN SETTINGS FOR LAN PORT 6, applicable to 7/8 port models only
switch --set-port-802dot1q-mode-ext 2:3 # LAN port 6 (Ext 2) is secure mode,
allows tagged frames only
switch --add-vtu-entry 311:3:1:1:1:1:2:1:3:1:1:0 # puts WAN and LAN3 into vid
311, LAN6 is tagged on egress
switch --add-vtu-entry 321:3:1:1:1:1:2:1:3:1:1:0  # puts WAN and LAN3 into vid
321, LAN6 is tagged on egress
switch --add-vtu-entry 331:3:1:1:1:1:2:1:3:1:1:0  # puts WAN and LAN3 into vid
331, LAN6 is tagged on egress
switch --add-vtu-entry 341:3:1:1:1:1:2:1:3:1:1:0 # puts WAN and LAN3 into vid
341, LAN6 is tagged on egress
#switch --set-port-default-vid-ext 2:311 # If untagged frames ingress on LAN
port 6/port Ext 2, place these into VLAN 311 (first VLAN)
#
```

Also a combination of tagged/untagged frames that ingress a port is possible. The following example has VLAN 211 and VLAN 221 defined for WAN and LAN port 1. VLAN 211 will be tagged egress on WAN and LAN port 1, whereas VLAN 221 will be tagged egress on WAN and untagged egress on LAN port 1. It is expected that VLAN 211 is tagged ingress on both WAN and LAN port 1, whereas VLAN 221 is tagged ingress on WAN and untagged ingress on LAN port 1. All other ports are not member of the VLANs. A management VLAN 951 is defined (untagged), which enables communication between system operator and CPE for management purposes (untagged).




```
switch --set-port-802dot1q-mode=0:3 # Sets the WAN port in check mode, allows
untagged on ingress if VID (incl default) is present in VTU
switch --set-port-default-vid=0:951 # Default VLAN for WAN port
switch --add-vtu-entry 951:2:1:1:1:1:2:0 # Management VLAN, enables contact to
CPU - untagged on egress
switch --set-port-802dot1q-mode=1:3 # Sets the LAN port in secure mode
switch --set-port-802dot1q-mode=2:3 # Sets the LAN port in secure mode
switch --set-port-802dot1q-mode=3:3 # Sets the LAN port in secure mode
switch --set-port-802dot1q-mode=4:3 # Sets the LAN port in secure mode
switch --add-vtu-entry 211:3:3:1:1:1:2:0 # put WAN and LAN port 1 into VLAN -
tagged on egress
switch --add-vtu-entry 221:3:2:1:1:1:2:0 # put WAN and LAN port into VLAN - un-
tagged on egress
switch --set-port-default-vid=1:221 # Default VLAN for LAN port 1
```

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provider mode (double tagging, q-in-q)

In provider network environments, it is very common to use double VLAN tagging to pass along the customer tag through the provider network by adding a provider tag on top of the customer tag. Double Tagging is a way to isolate one IEEE 802.1Q VLAN from other IEEE 802.1Q VLANs in a hierarchical fashion that is compatible with IEEE 802.1Q aware switches. This method places an extra or Double Tag in front of a frame's normal tag (assuming the frame was already Tagged), increasing the frame size by 4 bytes. Provider mode works for the WAN port only, and is simply enabled with the following syntax. The ingress ports default VLAN VID will be used as the double tag.

Note: Client ports must have their ingress 802.1Q mode set to disable

```
# Syntax is switch --set-port-802dot1q-provider-mode = Enable # Note default
VLAN must be defined for the ports
# Sets the IEEE 802.1Q provider mode for the WAN port.
# ENABLE is either
# 0=disable, disables IEEE 802.1Q (Q-in-Q) double tagging
# 1=enable,  enables  IEEE 802.1Q (Q-in-Q) double tagging
# The tag value is set by the --set-port-default-vid=0:VID option
# Example
switch --set-port-802dot1q-provider-mode = 1
```

isolate lan ports

The default is that the traffic can be switch between the LAN ports. The LAN port can be isolated by each other by issuing the command:

```
# Syntax for a port based VLAN is:--set-port-vlan-table=port:WAN_ENABLE:LAN1_
ENABLE:LAN2_ENABLE: LAN3_ENABLE:LAN4_ENABLE:CPU_ENABLE
# Enable which ports are enabled for communication.
# PORT_ENABLE is in the range 0..1

# Example, LAN1, LAN2, LAN3 and LAN4 can communicate with WAN but not between
the LAN ports
switch -set-port-vlan-table=0:1:1:1:1:1:1
switch -set-port-vlan-table=1:1:1:0:0:0:0
switch -set-port-vlan-table=2:1:0:1:0:0:0
switch -set-port-vlan-table=3:1:0:0:1:0:0
switch -set-port-vlan-table=4:1:0:0:0:1:0

# Please note that the ingress port setting mode for the client ports must be
set to disable
switch -set-port-802dot1q-mode=1:0
switch -set-port-802dot1q-mode=2:0
switch -set-port-802dot1q-mode=3:0
switch -set-port-802dot1q-mode=4:0
```

enable lan

The LAN ports are disabled per default. Therefore the configuration file should enable the LAN ports by

issuing the command:

```
switch --enable-lan
```

set lan port speed

All ports are default configured to 1000 Mbit/s full duplex. Change of this setting is possible by using the following command:

```
switch --set-port-speed-mode=<port>:<mode>

# <port> is 0, 1, 2, 3, or 4
# <mode> is 1000FD|1000HD|100FD|100HD|10FD|10HD|AUTO

# applicable to 7/8 port models only
switch --set-port-speed-mode-ext=<port>:<mode>

# <port> is 1, 2, 3, or 4, covering LAN port 5, 6, 7, or 8
# <mode> is 1000FD|1000HD|100FD|100HD|10FD|10HD|AUTO
```

set port mtu size

The MTU size can be programmed for each port. The following syntax can be used:

```
switch --set-port-mtu=[PORT]:[Jumbo Mode]

#Where [PORT] is 0…5

# applicable to 7/8 port models only
switch --set-port-mtu-ext=[PORT]:[Jumbo Mode]

#Where [PORT] is 1…4

#Where [Jumbo Mode] = 0 for 1522 bytes, 1 for 2048 bytes and 2 for 10240 bytes
```

igmp snooping

The device supports IGMP snooping, and join messages received from clients on the LAN ports will be handled by the CPE CPU, which will control which ports that belongs to which multi cast group. IGMP snooping has to be enabled per port but is running per default:

```
# Enable IGMP snooping on port 2, 3, 6 and 8
switch --enable-port-igmp-snooping=2:1
switch --enable-port-igmp-snooping=3:1

# applicable to 7/8 port models only
switch --enable-port-igmp-snooping-ext=2:1
switch --enable-port-igmp-snooping-ext=4:1

# Also unknown multicast traffic should be blocked. This can be done via the
```

```
following commands
switch --enable-port-block-unknown-multicast=1:1
switch --enable-port-block-unknown-multicast=2:1
switch --enable-port-block-unknown-multicast=3:1
switch --enable-port-block-unknown-multicast=4:1
switch --enable-port-block-unknown-multicast=5:1 # Important to include CPU
port, alternatively a membership to any of the multicast groups could cause the
CPU to be overloaded.

# applicable to 7/8 port models only
switch --enable-port-block-unknown-multicast-ext=2:1
switch --enable-port-block-unknown-multicast-ext=4:1


# It is recommended NOT to block unknown multicasts on port 0 (WAN), as all
client broadcasts are blocked, as broadcasts are considered as multicasts

# This will prevent unknown multicast traffic to be passed out on any of the
LAN ports. So it requires a join message on the specific LAN port, from a set-
top box, in order to have traffic passed on to that LAN port

# The IGMP can be shut off via SNMP, use dkt_ge.mib OID named “geIGMPSnooping”,
input parameter 0 = stops IGMP snooping. Alternatively in the configuration
file add the following: “mv /etc/init.d/igmp /etc/init.d/igmp2”
```

Note that blocking multicasts for port 5, will result in a blocking of ARPs originated for the WAN port also, as all broadcasts are considered as multicasts. In order to ensure that ARPs from the DHCP Server is still passed through, ARP mirroring function must be enabled.

```
switch --set-arp-mirroring=0:1 # Enables ARP mirroring, so ARPs received on WAN
port will be redirected to CPU port, despite the fact that multicast/broadcasts
are blocked on the CPE port
```

When an IGMP join is seen for a multicast group, then switch ATU is configured with a filter setting for this group, allowing traffic for the group to be bridged to the specific port.
Per default, the filter settings are kept until appropriate IGMP leave is seen for the particular multicast group.
This means that once a device has joined a multicast channel then the address will be present in the switch ATU until a leave is received by the IGMP snooper.
It is possible to enable a timeout in the IGMP snooper with default timeout values, the user must put this line in the CPE configuration file:

```
ENABLE_IGMP_TIMEOUT=1 /etc/init.d/igmp restart
#or “enable_igmp_timeout=1 /etc/init.d/igmp restart”
```

When the CPE detects IGMPv2/v3 join packet, and will establish a filter for the multicast group for the specific port seen, and set a default time-out value (for IGMPv2 the specified time-out value in the RFC, for IGMPv3 the value extracted from the join packet) for this specific multicast group. The switch filter will start to decrease this value immediately.
It is expected that a IGMP Query is present, followed by a IGMP report from the client, saying that it is still a member of the group
In some cases race conditions can occur, if the CPE filter times out before a client has responded to an IGMP query, hence signal will be lost, as CPE expect that the client is no longer member of the multicast group.
Therefore it is possible to change the default time-out values for the IGMP snooping.

To enable timeout and to increase timeout from defaults in the IGMP snooper, the user must put this line in the CPE configuration file (example with additional 77 seconds timeout):

```
ENABLE_IGMP_TIMEOUT=1 ADDITIONAL_IGMP_TIMEOUT=77 /etc/init.d/igmp restart
#or “enable_igmp_timeout=1 additional_igmp_timeout=77 /etc/init.d/igmp restart”
```

When the CPE detects IGMPv2/v3 join packet, and will establish a filter for the multicast group for the specific port seen, and set a default time-out value (for IGMPv2 the specified time-out value in the RFC, for IGMPv3 the value extracted from the join packet) for this specific multicast group. The switch filter will start to decrease this value immediately.
It is expected that a IGMP Query is present, followed by a IGMP report from the client, saying that it is still a member of the group
In some cases race conditions can occur, if the CPE filter times out before a client has responded to an IGMP query, hence signal will be lost, as CPE expect that the client is no longer member of the multicast group.

Therefore it is possible to change the default time-out values for the IGMP snooping.
To enable timeout and to increase timeout from defaults in the IGMP snooper, the user must put this line in the CPE configuration file (example with additional 77 seconds timeout):

```
ENABLE_IGMP_TIMEOUT=1 ADDITIONAL_IGMP_TIMEOUT=77 /etc/init.d/igmp restart
#or “enable_igmp_timeout=1 additional_igmp_timeout=77 /etc/init.d/igmp restart”
```

ingress rate limitation

TBD

The CPE includes 12 Port Ingress Rate Limitation buckets, that can be assigned to any of the CPE ports, both WAN and LAN ports.
Bytes to be counted:

- Accounts for all bytes
- Accounts for all bytes, Count all Layer 1 bytes:
  Preamble (8bytes) + Frame’s DA to CRC + IFG (12bytes)
- Accounts for all bytes, Count all Layer 2 bytes:
  Frame’s DA to CRC
- Accounts for all bytes, Count all Layer 3 bytes:
  Frame’s DA to CRC - 18 - 4 (if frame is tagged)
- Broadcast (BC), Multicast (MC) and Unknown multicast or unicast Traffic (UT).
  Broadcasts, BC # this should be used to limit any broadcast traffic
  Unknown multicast, UMC # this should be used as you don’t know the destination of any mul ticast traffic known multicasts, MC # this should be used only if you know the multicast traffic, must be present in the ATU

Non-Rate Limitation (NRL) overrides can be programmed for VLAN Id’s.
The following example creates two buckets:
Bucket 1 includes LAN port 3 and 4, which totally has an ingress data limitation of 1 Mbps, counted from layer 3 and upwards. Layer 1 and layer 2 statistics are not included/counted in this bucket.
Bucket 2 includes WAN port, which has an ingress data limitation of 2 Mbps, counted from layer 3 and upwards. Layer 1 and layer 2 statistics are not included/counted in this bucket.

This would match a situation where the service provider is offering a 2048/1024 kbps broadband connection to the Internet. Since the service provider may want to offer VoIP and/or IPTV, these services should not be counted in the bucket. A Non-Rate Limitation setting for the services can be made with the use of the VLAN Id's. In the example VLAN VID 100 is excluded from the buckets, and therefore they do not have any rate limitations assigned.

The following rate limitation structure for ingress must be followed:

```
•      64kbps ~ 1Mbps     : increments of 64kbps
•      1Mbps ~ 100Mbps    : increments of 1Mbps
•      100Mbps ~ 200Mbps  : increments of 10Mbps
```

The valid values are:

```
•      64, 128, 192, 256, 320, 384,..., 960
•      1000, 2000, 3000, 4000, ..., 100000
•      110000, 120000, 130000, ..., 200000
```

```
switch --add-vtu-entry 100:3:1:1:2:2:2:1
# put WAN and LAN port 3 and port 4 into VLAN 100, which could be IPTV. Notice
NRL bit is set, so this VLAN will bypass buckets

switch --add-vtu-entry 200:3:1:1:2:2:2:0
# put WAN and LAN port 3 and port 4 into VLAN, which could be data. Notice NRL
bit is not set, so this VLAN will not bypass buckets

#Uplink rate (DATA port 3 and 4, ingress rates of 1 Mbps)
#
# port=3, bucket=0, rate=1000kb/S, byte counter=layer3, limitation = drop
switch --set-port-ingress-rate-limit 3:0:1000:3:DROP

#Downlink rate (Total for WAN 2Mbps)
#switch --set-port-ingress-rate-limit 0:1:2000:3:DROP
# port=0(WAN), bucket=0, rate=2Mb/S, bytecounter=layer3, limitation=drop
#
# Non-Rate Limitation settings
# Enable NRL for all ports. If a VLAN is defined with "--add-vtu", see first
command in this example, having NRL bit set, then traffic from this VLAN (VID
100) is not counted inside the bucket
switch --port-enable-vid-nrl=1:1
switch --port-enable-vid-nrl=2:1
switch --port-enable-vid-nrl=3:1
switch --port-enable-vid-nrl=4:1
```

egress rate limitation

The egress rate can be set by each port. The default is full 1000Mbit access.
The integer part of the value could be used to set the egress rate for a given port:

```
switch --set-port-egress-rate-limit=0:8192 # set the WAN  port to 8Mbit/sec.
switch --set-port-egress-rate-limit=1:256 # set the LAN1 port to 256kbit/sec.
switch --set-port-egress-rate-limit=2: 1024 # set the LAN2 port to 1Mbit/sec.
switch --set-port-egress-rate-limit=3:8192 # set the LAN3 port to 8Mbit/sec.
switch --set-port-egress-rate-limit=4:512 # set the LAN4 port to 512kbit/sec.

# applicable to 7/8 port models only
switch --set-port-egress-rate-limit-ext=1:256 # set the LAN5 port to 256kbit/
```

```
sec.
switch --set-port-egress-rate-limit-ext=2: 1024 # set the LAN6 port to 1Mbit/
sec.
switch --set-port-egress-rate-limit-ext=3:8192 # set the LAN7 port to 8Mbit/
sec.
switch --set-port-egress-rate-limit-ext=4:512 # set the LAN8 port to 512kbit/
sec.
```

Because the egress rate of the WAN port is in opposite direction than the LAN port the egress rate can be used to limit the upload rate.

configuration of snmp values

The following SNMP values can be set by the configuration file:

SysContact the administrate contact for the network
`echo "syscontact techsupport@example.com" >> /etc/snmp/snmpd.local.conf`

SysLocation for the location of the system
`echo "syslocation somewhere" >> /etc/snmp/snmpd.local.conf`

SysName the name of the system e.g the customer identification
`echo "sysname customerXYZ" >> /etc/snmp/snmpd.local.conf`

syslog

Support for remote logging via syslog (RFC 3164)
To start syslog, enter the following line in your configuration file

```
syslogd [-l <log level>] -R <Remote server IP>
```

The syslog daemon sends logging information in UDP packets - port 514.

If all IP addresses are handled by the DHCP server, then there is also a way that the syslog daemon may be started by the DHCP client:

```
echo "-O logsrv" > /tmp/dhcp_requests.txt
/etc/init.d/udhcpc restart
```

The daemon will be started by the DHCP client if the log server parameter (DHCP option 7) is received in the DHCP response.

You may control which extra DHCP options that are requested in DHCP option 55. It is done by creating a file `/tmp/dhcp_requests.txt` containing just one line with a list of request commands to the DHCP client.

The format of the line is:
`-O <option name> [-O <option name>] ...`

The following values for `<option name>` are currently supported:

Name	DHCP Option	Description
dns	6	Domain name server IP
logsrv	7	Log server IP address
hostname	12	Hostname of the box

domain	15	Domain name
serverid	54	DHCP server identifier

surveillance via snmp

Various information about the node and the switch can be access via SNMP. Some of these can also be set by snmp - but the setting is lost during a power reset. To persist a setting it must be set as part of the configuration file. The MIBs for SNMP management is available at www.dktcomega.com -> support -> firmware. These can be loaded into a standard MIB browser or 3rd party SNMP management system.

CATV setup
The CATV module can be setup, on/off mode:

```
switch -c 1
switch -c 0

# Turn CATV module off
switch -c 0

# Turn CATV module on
switch -c 1
```

quality of service (qos)

Per default all ports and traffic types have equal priority. Prioritization based on packet ToS or DiffServ value can be made.
Below is an example of prioritization based on ToS value, where the switch engine will inspect the value from 0 - 7. The switch holds 4 queues per port, where 3 is highest priority and 0 is lowest.

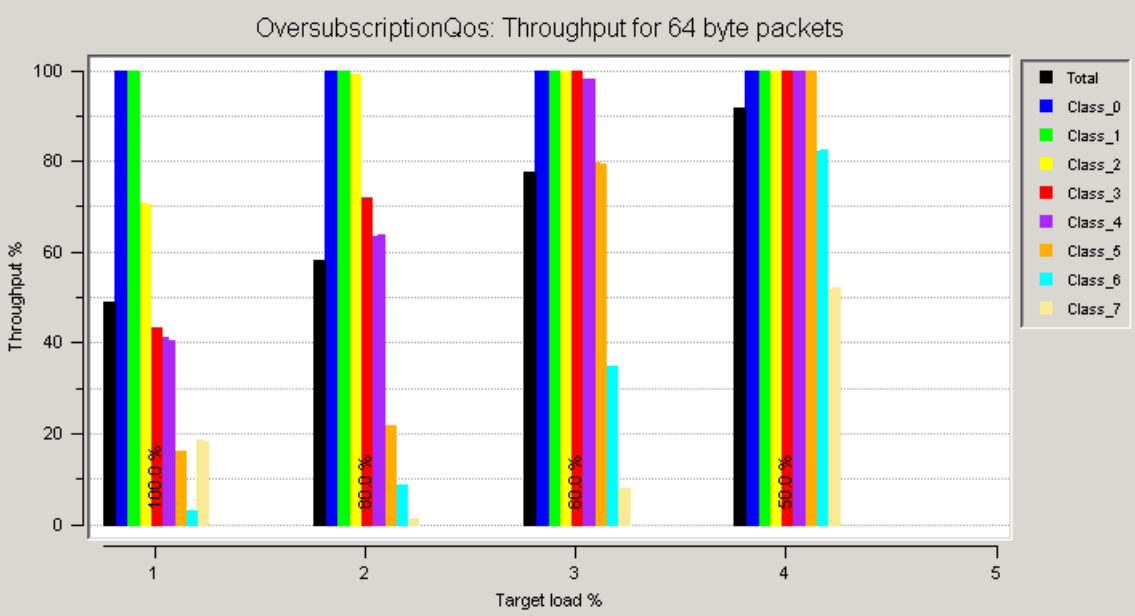
```
switch --set-port-ieee-tag-priority=0:1 #Enables prioritization for WAN port
switch --set-port-ieee-tag-priority=1:1 #Enables prioritization for LAN port1
switch --set-port-ieee-tag-priority=2:1 #Enables prioritization for LAN port2
switch --set-port-ieee-tag-priority=3:1 #Enables prioritization for LAN port3
switch --set-port-ieee-tag-priority=4:1 #Enables prioritization for LAN port4
switch --set-port-ieee-tag-priority=5:1 #Enables prioritization for CPU port

# applicable to 7/8 port models only
switch --set-port-ieee-tag-priority-ext=1:1 #Enables prioritization for LAN
port 5
switch --set-port-ieee-tag-priority-ext=2:1 #Enables prioritization for LAN
port 6
switch --set-port-ieee-tag-priority-ext=3:1 #Enables prioritization for LAN
port 7
switch --set-port-ieee-tag-priority-ext=4:1 #Enables prioritization for LAN
port 8

switch --set-ieee-queue-map=7:3 # ToS value of 7 will go to queue with highest
priority
switch --set-ieee-queue-map=6:3 # ToS value of 6 will go to queue with highest
priority
switch --set-ieee-queue-map=5:2 # ToS value of 5 will go to queue with next
highest priority
switch --set-ieee-queue-map=4:2 # ToS value of 4 will go to queue with next
highest priority
```

```
switch --set-ieee-queue-map=3:1 # ToS value of 3 will go to queue with low pri-
ority
switch --set-ieee-queue-map=2:1 # ToS value of 2 will go to queue with low pri-
ority
switch --set-ieee-queue-map=1:0 # ToS value of 1 will go to queue with lowest
priority
switch --set-ieee-queue-map=0:0 # ToS value of 0 will go to queue with lowest
priority
```

Using a traffic analyzer, where we have defined 8 traffic classes, each sending 12.5% in an over subscription configuration, we can see that Class_0 programmed with ToS value = 7, Class_1 programmed with ToS value =6 … Class_7 programmed with ToS value = 0 will be prioritized according to the specification above.



The same goes for Differentiated Services, where the value can be between 0 - 63.

```
Switch --set-port-ip4ip6-priority-field=0:1 #Enables prioritization for WAN
port
switch --set-port-ip4ip6-priority-field=1:1 #Enables prioritization for LAN
port1
switch --set-port-ip4ip6-priority-field=2:1 #Enables prioritization for LAN
port2
switch --set-port-ip4ip6-priority-field=3:1 #Enables prioritization for LAN
port3
switch --set-port-ip4ip6-priority-field=4:1 #Enables prioritization for LAN
port4
switch --set-port-ip4ip6-priority-field=5:1 #Enables prioritization for CPU
port

# applicable to 7/8 port models only
switch --set-port-ip4ip6-priority-field-ext=1:1 #Enables prioritization for LAN
port 5
switch --set-port-ip4ip6-priority-field-ext=2:1 #Enables prioritization for LAN
```

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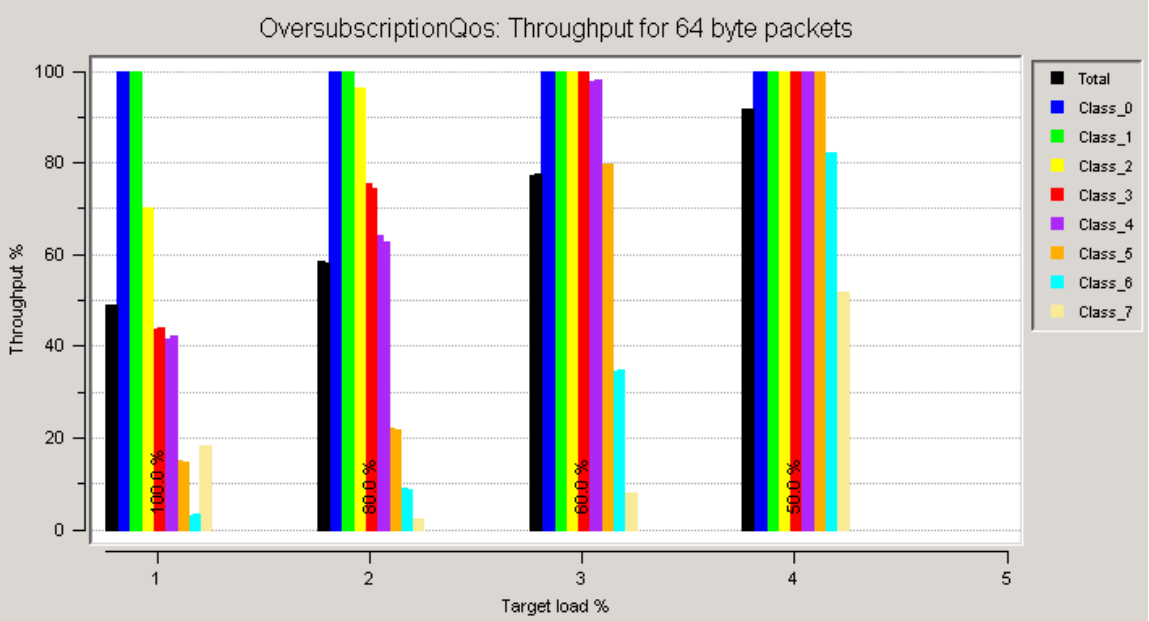
```
port 6
switch --set-port-ip4ip6-priority-field-ext=3:1 #Enables prioritization for LAN
port 7
switch --set-port-ip4ip6-priority-field-ext=4:1 #Enables prioritization for LAN
port 8

switch --set-ip4ip6-queue-map=63:3 # DiffServ value of 63 will go to queue with
highest priority
switch --set-ip4ip6-queue-map=62:3 # DiffServ value of 62 will go to queue with
highest priority
switch --set-ip4ip6-queue-map=61:2 # DiffServ value of 61 will go to queue with
next highest priority
switch --set-ip4ip6-queue-map=60:2 # DiffServ value of 60 will go to queue with
next highest priority
switch --set-ip4ip6-queue-map=59:1 # DiffServ value of 59 will go to queue with
low priority
switch --set-ip4ip6-queue-map=58:1 # DiffServ value of 58 will go to queue with
low priority
switch --set-ip4ip6-queue-map=57:0 # DiffServ value of 57 will go to queue with
lowest priority
switch --set-ip4ip6-queue-map=56:0 # DiffServ value of 56 will go to queue with
lowest priority
```

Using a traffic analyzer, where we have defined 8 traffic classes, each sending 12.5% in an over subscription configuration, we can see that Class_0 programmed with DiffServ value = 63, Class_1 programmed with DiffServ value =62 … Class_7 programmed with DiffServ value = 56 will be prioritized according to the specification above.



The IEEE 802.1 Prioritization remapping supports 8 priorities, parameter value 0…7. If the 802.1Q is enabled for the ports a prioritization can be associated to each VLAN

```
# Syntax is switch --add-vtu-entry=VID:WAN:LAN1:LAN2:LAN3:LAN4:CPU:NRL-ENABLE[:PRIORITY]
switch --add-vtu-entry=100:3:2:2:1:1:2:0:5 # priority tag of 5 will be associated with VLAN id 100.
```

```
# Applicable to 7/8 port models only
# Syntax is switch --add-vtu-entry-ext=VID:WAN:LAN1:LAN2:LAN3:LAN4:CPU:LAN5:LAN
6:LAN7:LAN8:NRL-ENABLE[:PRIORITY]
```

```
switch --add-vtu-entry=100:3:2:2:1:1:2:1:1:1:1:0:5 # priority tag of 5 will be
associated with VLAN id 100.
```

reboot

The device can be accessed via TELNET, and is rebooted with the use of “reboot” command. TELNET access must however be configured in the configuration file.

```
# The following command enables TELNET access from WAN
telnetd -l /bin/sh
```

save configuration to flash

Per default device configuration is provisioned via DHCP at boot, and it will be stored in device RAM memory, which means that the device would need to have the configuration loaded at every boot.

Concept is if dhcp service is out, the device will restore its latest saved - the latest saved configuration is the incident where there is a difference between saved configuration and provisioned configuration. Also the CPE will get an ad-hoc link-local IP address, which is an auto configuration algorithm described in the IETF Draft “Dynamic Configuration of IPv4link-local addresses”.

Procedure is to
- insert a syntax in the configuration file “save_configuration”

Please note that the syntax “save_configuration” will be filtered by the device, so if you do a “cat /tmp/config.sh” or “cat /mnt/flash/config.sh” this command is not visible.

When dhcp service comes back, then the device will lease an IP address again, but not fetch any new configuration, as it will keep its restored configuration until next boot process.

```
# The following command allows the configuration to be saved to flash memory,
and this will be restore if dhcp service is out.
save_configuration
```

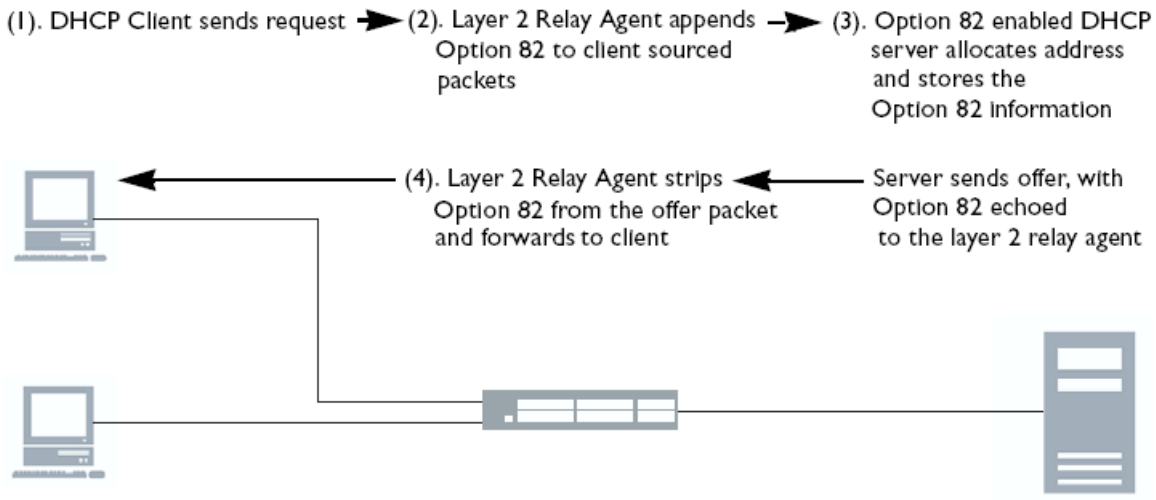
dhcp option 82

DHCP Option 82 relay feature is supported from firmware revision 03_00 and later.
DHCP Relay Agent Information Option 82 is an extension to the Dynamic Host Configuration Protocol (DHCP), and is defined in RFC 3046 and RFC 3993. DHCP Option 82 can be used to send information about DHCP clients to the authenticating DHCP server. DHCP Option 82 can as an example identify the VLAN number, port number as well as a customer ID of a client, during any IP address allocation. When DHCP Option 82 is enabled on the CPE, it inserts the per port defined information into the DHCP packets as they pass through the CPE on their way to the DHCP server. The DHCP server stores the IP allocation record. The CPE will strip off the DHCP reply from the DHCP server, so the clients will never see the DHCP option 82 information.

The DHCP Option 82 information can hold a 32 char string per port.

```
# Syntax is switch --set-port-dhcp-option82=PORT:enable[:<optional text>]
switch --set-port-dhcp-option82=1:1:”VLAN 100, LAN port 1”
switch --set-port-dhcp-option82=2:1:”VLAN 200, LAN port 2”
switch --set-port-dhcp-option82=3:1:”VLAN 300, LAN port 3”
switch --set-port-dhcp-option82=4:1:”VLAN 400, LAN port 4”
```

```
# Applicable to 7/8 ports only
# Syntax is switch --set-port-dhcp-option82-ext=PORT:enable[:<optional text>]
switch --set-port-dhcp-option82-ext=1:1:"VLAN 100, LAN port 5"
switch --set-port-dhcp-option82-ext=2:1:"VLAN 200, LAN port 6"
switch --set-port-dhcp-option82-ext=3:1:"VLAN 300, LAN port 7"
switch --set-port-dhcp-option82-ext=4:1:"VLAN 400, LAN port 8"
```


(1). DHCP Client sends request
(2). Layer 2 Relay Agent appends Option 82 to client sourced packets
(3). Option 82 enabled DHCP server allocates address and stores the Option 82 information
(4). Layer 2 Relay Agent strips Option 82 from the offer packet and forwards to client
Server sends offer, with Option 82 echoed to the layer 2 relay agent

lldp/edp/cdp

LLDP/EDP/CDP feature is enabled using the following syntax in the configuration script:

```
# Syntax is /etc/init.d/lldpd start [-OPTIONAL MODE <C | E | F>]
/etc/init.d/lldpd start # Starts LLDP on WAN port
/etc/init.d/lldpd start -C # Starts LLDP and CDP on WAN port
/etc/init.d/lldpd start -E # Starts LLDP and EDP on WAN port

# combinations of the above is also possible
/etc/init.d/lldpd start -CEF # Starts LLDP and CDP/EDP/Foundry DP on WAN port
```

support for ssh

Please note that support for SSH is available for all DKTCOMEGA CPE platforms except HW revision "FE1 0" or earlier. HW revision can found via SNMP OID -.1.3.6.1.4.1.27304.10.1.0

Alternatively with DKT-GENERIC-MIB::hwVersion.0
HW with values of "ERROR" or "FE1 0" do not support SSH.

In order to have SSH support, please insert the following command in the configuration script:

```
# SSH daemon is started with the following command
/etc/init.d/sshd start
```

The CPE is preconfigured with a login for SSH, please consult DKTCOMEGA for user name and password.

The first time the SSH daemon is started; two secret key files are generated.

Please note that it takes a while to generate the secret key files. The secret key files are not automatically stored to flash.

Save the SSH secret key files to flash using save_configuration in the configuration file:

```
# Save configuration to flash memory, same SSH key is used at every boot
save_configuration
```

Now it is possible to log into the CPE as the user "Administrator" (case sensitive) through SSH.

```
ssh Administrator@<IP address>
```

or

```
ssh -l Administrator <IP address>
```

or using e.g. Putty application

When logged in as Administrator, it is not possible to make any changes, as you must switch user to root with this command:

```
su
```

Now it is possible to run all of the configuration commands, and it is possible to change the password of the user with the command

```
passwd <username>
```

If password is changed remember save to flash with the `save_configuration` command.

When finished, type `exit` to return to the Administrator user.
To log out, type `exit` again.

The daemon is started by the normal configuration file by inserting the following commands (the lines should replace the telnetd command):

```
# Some configuration commands
# Start SSH daemon
/etc/init.d/sshd start
# Save configuration and SSH secret files to flash
save_configuration
```

The sshd script automatically restores password- and SSH key files from flash before the SSH daemon is started.

Procedure for changing SSH password on all CPE units.
If password for Administrator is to be changed for all CPE's do the following:

1) Log into one CPE via ssh
2) change user to root with command `su`
3) `cd /etc`
4) change password of the CPE
5) Now copy the shadow file to a tftp server, typing "`tftp -p -l shadow -r shadow <TFTP Serv-`

```
er IP Address>"
```

This file has to be pushed to all CPE's
6) you can edit CPE's configuration files by inserting the following commands:

```
tftp -g -r shadow -1 /tmp/shadow <TFTP Server IP Address> # This will get the
shadow file for Administrator from TFTP server and temporarily store this in /
tmp directory

chown root /tmp/shadow # change owner of shadow

chmod 600 /tmp/shadow # change rights of shadow

mv /tmp/shadow /etc/ # move the shadow file to correct directory

save_configuration # save configuration to flash memory, now the password is
saved locally on each CPE
```

built-in voip ata (for 796x3, 796x4, 79615, 79616) dhcp/tftp based provisioning

The built-in ATA will get its configuration file from a TFTP server when enabled, this file holds all ATA specific parameters, as listed in the following sections and can be tailored specifically for each ATA unit, please refer to Appendix 1 - ATA configuration file
The VoIP ATA is enabled using the following syntax:

```
enable_voip [-s <configuration file TFTP server>]
            [-v <VLAN ID> { -i <IP> -m <netmask> } ]
            <configuration file name>
If -s is not specified, then the TFTP server will be the same as the server for
the CPE configuration file.
If VLAN is specified, -i and -m (IP and netmask) must be specified if a specif-
ic IP address/netmask is desired, alternatively it will obtain its address via
DHCP. A route entry will be created for the new VoIP network.

enable_voip -s 192.168.1.1 -v 100 voip_settings.txt

# example ATA will get the voip_settings.txt from TFTP Server 192.168.1.1, and
obtain an IP address via DHCP. All frames will be tagged via a VID of 100.
```

If ATA packets should be untagged along with the CPE management, the following command should be used:

```
# example ATA packets will be untagged, TFTP server will be the same as for the
CPE part
enable_voip voip_settings.txt
```

The ATA and CPE part share the same MAC address, but if the ATA part is configured in a separate VLAN, then the ATA and CPE parts will get their individual IP addresses, based on the networking topology.

web interface

Alternatively the ATA can be managed via HTTP browser by inserting http://<IP Address>

- User name: <to be disclosed by DKTCOMEGA>
- Password: <to be disclosed by DKTCOMEGA>

system parameters

Generic settings for the ATA plug-in module can be configured under System

- ATA Manager Logon
- Date/Time
- Network Device Configuration
- Static Network Configuration
- Dynamic Network Configuration
- Remote Configuration Access
- NAT Transversal Parameters
- Update Parameters
- ATA Maintenance
- System Identification

Accounts:

Parameter	Description	Default
ata service name	Brand or service name used by telephone service provider	VoIP Service Plan Name
ata admin name	Administrator configuration access name, Please consult DKTCOMEGA for user name and password	**********
ata admin password	Administrator password, Please consult DKTCOMEGA for user name and password	**********
ata user name	User configuration access name	
ata user password	User password	
ata user message	Message which is displayed to the user when they access the ATA web interface	Thank you for purchasing this DKTCOMEGA ATA

Date/Time:

Parameter	Description	Default
ata date	Current date	2004/7/4
ata time	Current time	12:00:00
ata time zone	Number of hours to subtract from GMT to form local time	-5
ata daylight savings enable	Enable local application of day-light savings time	Enabled

ata timeserver enable	Enable use of network time-server	Enabled
ata timeserver domain name	Fully qualified domain name (including an optional port number) for the NTP/SNTP timeserver server	time-a.nist.gov

Network Device Configuration:

Parameter	Description	Default
net assigned router name	Manually configured router device name	DKTCOMEGA_ATA
net assigned host name	Manually configured host device name (or name automatically assigned and saved)	DKTCOMEGA _ATA
net assigned domain name	Manually configured domain name	(empty)
net assigned mtu	Manually configured maximum transmit unit size (range of 576 to 1500)	1492
net assigned cloned mac address	Alternate Ethernet MAC address used for cloning an existing device (required for special situations only)	(empty)

Static Network Configuration:

Parameter	Description	Default
net static config enable	Enable static network configuration	Disabled
net static ip address	Manually configured IP address (or address automatically assigned and saved)	0.0.0.0
net static netmask	Manually configured local network mask (or netmask automatically assigned and saved)	255.255.255.0
net static gateway address	Manually configured gateway IP address (or address automatically assigned and saved)	0.0.0.0

DNS Configuration:

Parameter	Description	Default
net dns primary address	Manually configured IP address of primary domain name server (DNS)	0.0.0.0
net dns secondary address	Manually configured IP address of backup domain name server (DNS)	0.0.0.0
net dns parallel search mode	Uses both DNS servers concurrently when enabled	Disabled

Dynamic Network Configuration:

Parameter	Description	Default
net isp dhcp enable	Enable use of DHCP for automatic local IP address configuration	Enabled
net isp pppoe enable	Enable use of PPPoE for automatic local IP address configuration and public network access	Disabled
net isp user name	PPPoE or PPTP user name	(empty)
net isp password	PPPoE or PPTP password	(empty)

net isp dhcp discover duration	A parameter to enable DHCP retries. This parameter is in units of seconds and sets how long after a DHCP timeout that the ATA will restart sending DHCP discovers.	0 (Disabled)
net isp connect on demand enable	Enable PPPoE or PPTP connection on demand	Disabled
net isp connect on demand interval	Idle period for disconnection in seconds	0
net isp keep alive enable	Keep PPPoE or PPTP connection active when enabled	Disabled
net isp keep alive interval	Interval for keep alive messages in seconds	0
net isp save as assigned	Enable saving of results acquired automatically as the assigned address, netmask and gateway for later restarts. When this is enabled the ATA saves the IP information (IP address, netmask, gateway, DNS servers) obtained from a DHCP response in the appropriate parameters ('net static ip address', 'net static netmask', 'net static gateway address', 'net dns primary address', 'net dns secondary address')	
net isp reconnect on link loss	Enable automatic reconnection on link loss (retains initial configuration if disabled), CURRENTLY NOT IMPLEMENTED n/a	Disabled

Remote Access Configuration:

Parameter	Description	Default
ata web external server enable	Enable access to configuration procedures from external IP addresses	Enabled
ata web internal server enable	Enable access to configuration procedures from local IP addresses	Enabled
ata web server port	Port number for configuration web server	0 (Defaults to 80)
ata web server language	Language selection	English
ata telnet server enable	Enable remote access via telnet protocols	Enabled
ata telnet port	Telnet Port no	
ata ftp server enable	Enable remove access via ftp protocols	Enabled
ata ftp port	FTP Port no	

NAT Transversal Parameters:

Parameter	Description	Default
nat stun enable[2]	Enables use of STUN for discovery of network address translation (NAT) mapping	Enabled

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nat stun server domain name	Fully qualified domain name (including optional port number) for the STUN server	stun.fwdnet.net
nat stun symmetric deterministic enable	Enables STUN deduction for a symmetric deterministic firewall	Enabled
nat turn enable	Enables use of TURN for discovery of network address translation (NAT) mapping	Disabled
nat turn server domain name	Fully qualified domain name (including optional port number) for the STUN server	(empty)
nat ice enable	Enables use of ICE for discovery of network address translation (NAT) mapping and exchange via SIP	Disabled

[2]If STUN is enabled the ATA will wait until STUN completes or times out before it will send the INVITE on an outgoing call or begin to ring on an incoming call. Please notice that this can cause delays in making and receiving calls if the STUN service is not used, but enabled.

Update Parameters:

Parameter	Description	Default
ata local update enable	Control to enable a manual update operation from a local PC running the provided ATA local update services	Disabled
ata local update domain name	Fully qualified domain name (including an optional port number) for the update server	(empty)
ata update domain name	Fully qualified domain name (including an optional port number) for the update server	TBD
ata configuration update enable	Control to enable automatic updating of configuration	Enabled
ata configuration update on reset	Control to enable automatic update of configuration on reset	Enabled
ata configuration update from sip	Control to enable automatic update on receipt of SIP message	Disabled
ata configuration request message	SYSLOG message body sent when requesting a configuration update	(empty)
ata configuration success message	YSLOG message body sent when configuration update completed successfullys	Configuration update successful
ata configuration failed message	SYSLOG message body sent when configuration update completed unsuccessfully	Configuration update failed
ata configuration update periodic delay	Periodic delay in seconds between configuration update checks	3600
ata configuration update random delay	Uniform random delay in seconds applied when contact with the update server fails	240

ata configuration update error retry delay	Fixed delay in seconds applied when the configuration update operation fails	120
ata firmware update enable	Control to enable automatic updating of firmware	Enabled
ata firmware update on reset	Control to enable automatic update of firmware on reset	Enabled
ata firmware request message	SYSLOG message body sent when requesting a firmware update	(empty)
ata firmware success message	SYSLOG message body sent when firmware update completed successfully	Firmware update successful
ata firmware failed message	SYSLOG message body sent when firmware update completed unsuccessfully	Firmware update failed
ata firmware update periodic delay	Periodic delay in seconds between firmware update checks	86400
ata firmware update random delay	Uniform random delay in seconds applied when contact with the update server fails	240
ata firmware update error retry delay	Fixed delay in seconds applied when the firmware update operation fails	120

ATA Maintenance:

Parameter	Description	Default
ata help url	URL for ATA configuration help (default page says no help available here)	help.html
ata logo url	URL for ATA logo (default logo is stored in ATA when manufactured)	Atalogo.jpg
net syslog enable	Control to enable transmission of SYSLOG messages	Disabled
net syslog server	Fully qualified domain name (including an optional port number) for the SYSLOG server	(empty)
net debug enable	Control to enable transmission of developer debug messages	Disabled
net debug server	Fully qualified domain name (including an optional port number) for the debug server	(empty)
net debug level ata	Debug message level hex bitmask for ATA layer function	7
net debug level sip	Debug message level hex bitmask for SIP layer function	307
net debug level mgcp	Debug message level hex bitmask for MGCP layer function	307
net debug level net	Debug message level hex bitmask for NETWORK layer function	7

net debug level omc	Debug message level hex bitmask for OMC layer function	7
net debug level pmp	Debug message level hex bitmask for PUMP layer function	7

System Identification:

Parameter	Description	Default
ata copyright notice	DKTCOMEGA's copyright notice	(C) 1994-2009 DKTCOMEGA
ata manufacturer	Manufacturer name	DKTCOMEGA.
ata model number	Product model number	TBD
ata serial number	Serial number assigned during manufacture	(as assigned)
ata hardware revision	Hardware revision	0.30
ata boot rom revision	Boot code revision	3.28.00
ata firmware revision	Run-time code revision	3.31.01
ata configuration revision	Configuration file revision	3.28.00
net hardware mac address	Ethernet MAC address assigned during manufacture	(as assigned)
net unique device id	Unique device ID including Ethernet MAC used for DHCP and update operations	(as assigned)

Voip accounts

The VoIP Provider Parameters configure the user account access for up to four providers. Following are brief descriptions of the parameters available for each account.

VoIP Account #1 - #4:

Parameter	Description	Default
voip provider 1.provider name	Name of VoIP provider	(empty)
voip provider 1.provider type	Type of VoIP provider	Disabled
voip provider 1.distinctive ring type	Distinctive ring type	1
voip provider 1.dialing prefix	Dialing prefix to select provider (such as 10288)	(empty)
voip provider 1.preferred codecs	List of numeric codec types in order of preference	(empty)
voip provider 1.incoming mode	Incoming call distribution mode (ring all, hunt all, ring group or hunt group)	Ring All
voip provider 1.group line 1 enable	Line 1 enable for group	Enable
voip provider 1.group line 2 enable	Line 2 enable for group	Enable

voip provider 1 use outbound proxy		
voip provider 1.display name	Outgoing caller ID display name	(empty)
voip provider 1.user name	User name such as an E.164 number	(empty)
voip provider 1.domain name	Authentication domain name (or realm)	(empty)
voip provider 1.auth user name	User name for authentication	(empty)
voip provider 1.auth domain name	Fully qualified domain name used as the authentication realm	(empty)
voip provider 1.auth user password	User password for authentication	(empty)
voip provider 1.proxy domain name	Fully qualified domain name (with optional port number) for the SIP proxy server	(empty)
voip provider 1.register domain name	Fully qualified domain name (with optional port number) for the SIP registration server	(empty)
voip provider 1.reregister interval	Re-registration period in seconds	120
voip provider 1.subscription domain name	Fully qualified domain name (with optional port number) for the SIP subscription server	(empty)
voip provider 1.resubscribe interval	Re-registration period in seconds	0

Dial Prefix Contains the dial string pattern matching used to distinguish and route calls to a VoIP service provider.

VoIP Provider Defaults:

Parameter	Description	Default
voip default display name	Display name used as the name in the caller ID	default_display_name
voip default user name	Login user name	default_user_name
voip provider default1	Default provider selection	1
voip provider alternate1	Alternate provider to use when selected provider is unavailable (0 to disable)	0
voip provider default line 1	Default provider selection for line 1	1
voip provider alternate line 1	Alternate provider for line 1 to use when selected provider is unavailable (0 to disable)	0
voip provider default line 2	Default provider selection for line 2	1
voip provider alternate line 2	Alternate provider for line 2 to use when selected provider is unavailable (0 to disable)	0

Voip parameters

The VoIP Protocol Parameters control various common aspects of the ATA device. These include:

- Audio Settings
- RTP Protocol Parameters
- SDP Protocol Parameters
- SDP Audio Codec Names

Audio Settings:

Parameter	Description	Default
voip preferred codecs	List of numeric codec types in order of preference	18 0
voip silence supression enable	Enables comfort noise/silence processing	Disabled
voip echo canceller enable	Enables the G.168 echo canceller	Enabled
voip echo canceller mode	Sets the echo canceller operating mode	2
voip echo canceller tail length	Specifies length of echo canceller in msec	16
voip fax processing mode	Control for FAX processing method: off, pass through (uLaw or Alaw) or real-time FAX (T.38)	Off
voip fax processing rate	Controls the fax processing rate (0 to 5 for 2400 to 14400 respectively)	5

RTP Protocol Parameters:

Parameter	Description	Default
rtp port minimum	The minimum RTP port number to be used	1234
rtp port maximum	The maximum RTP port number to be used	65535
rtp public external ip address	Force a specific external IP address for SDP messages sent (disabled when 0.0.0.0)	0.0.0.0
rtp public external port min	Specifies the fixed RTP port mapping performed by a NAT firewall associated with the minimum RTP port number (disabled when 0)	0
rtp tos value	Type of service (TOS) value or DIFFServ DSFIELD used for SIP messages as a hexidecimal value	0x68
rtp packet duration	The duration in msec for frame-based codecs	30
rtp stream duration	The duration in msec for sample stream-based codecs	20
rtp session timeout interval	The session timeout interval in seconds	120

rtp jitter buffer start depth	Jitter buffer depth at startup in msec	20
rtp jitter buffer minimum depth	Jitter buffer minimum depth	20

SDP Protocol Parameters:

Parameter	Description	Default
DP Session Name	-	
SDP Session Owner	DKTCOMEGA	
SDP ignore stun		

Parameters are passed on to end-point for outgoing calls only

SDP Audio Codec Names:

Parameter	Description	Default
sdp g711u codec name	G.711 ulaw codec name	PCMU/8000
sdp g711a codec name	G.711 alaw codec name	PCMA/8000
Sdp cn codec name	Comfort noise codec name	CN
sdp g729 codec name	G.729/G.729A codec name	G729/8000
sdp g729b codec name	G.729B codec name	G729B/8000
sdp t38 codec name	T.38 codec name	T38/8000
Sdp NSE codec name	Named Signaling Event codec name	X-NSE/8000

SDP Audio Codec Dynamic Code Points:

Parameter	Description	Default
sdp g711u codec dyn pt	G.711 ulaw dynamic payload type	0
sdp g711a codec dyn pt	G.711 alaw dynamic payload type	0
Sdp cn codec dyn pt	Comfort noise dynamic payload type	0
sdp g729 codec dyn pt	G.729/G.729A dynamic payload type	0
sdp g729b codec dyn pt	G.729B dynamic payload type	109
sdp t38 codec dyn pt	T.38 dynamic payload type	108
sdp NSE codec dyn pt	Named Signaling Event dynamic payload type	100

sip parameters

The SIP (Session Initiation Protocol) Parameters control particular aspects of the SIP protocols. These parameters include:

- SIP Protocol Parameters
- SIP Response Codes

- SIP Distinctive Ring Names
- SIP Protocol Timers

SIP Protocol Parameters:

Parameter	Description	Default
sip user agent	User-Agent header for outbound responses if not empty	DKTCOMEGA 3.27
sip require user name	Require username to match for incoming calls	Disabled
sip local port	Local UDP port used for sending/ receiving SIP call control messages	5060
sip public external ip address	Force a specific external IP address for SIP messages sent (disabled when 0.0.0.0)	0.0.0.0
sip public external sip port	Force a specific external UDP port for SIP messages sent (disabled when 0)	0
sip tos value	Type of service (TOS) value or DIFFServ DSFIELD used for SIP messages as a hexidecimal value	0x68
sip accept language string	Specifies the language for user viewable messages used in the SIP accept message	(empty)
sip send response to src port	Respond to the sender's IP address/UDP port used by SIP request message	Enabled
sip max forwards	Maximum forward value	15
sip ringing retransmit	Enables ringing invite retransmission	Enabled
sip use nat discovery	Enable use of NAT discovery procedures to obtain an external IP address/UDP port mapping for SIP messages	Enabled
sip use received via info	Use VIA header IP address/UDP port parameters in received messages as external IP address/ UDP port	Disabled
sip nat keep alive enable	Send periodic SIP messages to keep port mapping active	Disabled
sip nat keep alive interval	Periodic interval in seconds for SIP keep alive messages	15
sip nat keep alive domain name	Fully qualified domain name (including an optional port number) for the destination of SIP keep alive message (sends to the proxy server if empty)	(empty)
sip nat keep alive message	Type of message to be sent as SIP keep alive: empty, notify or register	(empty)

sip prack enable	Enables support for Provisional Response ACKnowledgement, PRACK (supported from firmware 05_05b6 or later)	Disabled

SIP Response Codes:

Parameter	Description	Default
sip response code sit1	SIP response code which plays the SIT1 tone sequence	0
sip response code sit2	SIP response code which plays the SIT2 tone sequence	0
sip response code sit3	SIP response code which plays the SIT3 tone sequence	0
sip response code sit4	SIP response code which plays the SIT4 tone sequence	0
sip response code try backup	SIP response code to use backup server	0
sip response code retry registration	SIP response code to retry the registration	30

SIP Distinctive Ring Names:

Parameter	Description	Default
sip distinctive ring names 1	Telephone event name to produce distinctive ring pattern 1	Belcore-r1
sip distinctive ring names 2	Telephone event name to produce distinctive ring pattern 2	Belcore-r2
sip distinctive ring names 3	Telephone event name to produce distinctive ring pattern 3	Belcore-r3
sip distinctive ring names 4	Telephone event name to produce distinctive ring pattern 4	Belcore-r4
sip distinctive ring names 5	Telephone event name to produce distinctive ring pattern 5	Belcore-r5
sip distinctive ring names 6	Telephone event name to produce distinctive ring pattern 6	Belcore-r6
sip distinctive ring names 7	Telephone event name to produce distinctive ring pattern 7	Belcore-r7
sip distinctive ring names 8	Telephone event name to produce distinctive ring pattern 8	Belcore-r8

SIP Protocol Timers:

Parameter	Description	Default
sip timer invite expires	Invite expiration in seconds	180
sip timer reinvite expires	Re-invite expiration in seconds	180
sip timer registration min	Registration period minimum in seconds	1
sip timer registration max	Registration period maximum in seconds	7200
sip timer registration retry	Registration expiration in seconds	30

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sip timer no answer duration	No answer duration in seconds	300
sip session time	Session expiration in seconds	1800

SIP Server Configuration:

Parameter	Description	Default
sip allow incoming subscription		Disabled
sip subscribe authentication		Disabled
sip incoming resubscribe interval	Resubscribe interval in seconds	3600
sip allow incoming registration		Disabled
sip register authentication		Disabled
sip incoming reregister interval	Reregister interval in seconds	3600
sip invite authentication		Disabled
sip bye authentication		Disabled
sip notify authentication		Disabled
sip incoming auth user name		(empty)
sip incoming auth realm		(empty)
sip incoming auth password		(empty)

ipbx parameters

IPBX Parameters:

The parameters in the following three sections control the connection to the local phone (FXS) port on the ATA. This includes control of both the SLIC (Subscriber Line Interface Circuit) and SLAC (Subscriber Line Audio Circuit) that together make up the FXS port. The first section, below, offers separate control for voice and tone signals, of parameters including transmit and receive levels, and of DTMF tone characteristics.

Parameter	Description	Default
ipbx voice rx gain	Additional voice receive gain in dB units	0
ipbx voice tx gain	Additional voice transmit gain in dB units	0
ipbx tone gain	Additional tonal signal gain in dB units	0
ipbx tone max	Maximum tonal signal level in dBm	-12
dtmf low tone gain	Low frequency group DTMF tone level in dBm	-9
dtmf high tone gain	High frequency group DTMF tone level in dBm	-7
dtmf tone on time	DTMF generation on time in msec	80
dtmf tone off time	DTMF generation off time in msec	80

dtmf detect abcd	DTMF detection enable for ABCD dual tone pairs	Enabled
dtmf generate abcd	DTMF generation enable for ABCD dual tone pairs	Enabled
dtmf pad duration	DTMF out-of-band on time in msec	100
dtmf wait duration	DTMF out-of-band off time in msec	50
dtmf playout min duration	DTMF out-of-band minimum on time in msec	100

Timers:

Parameter	Description	Default
ipbx brief pause duration	Time in 10 msec units before tone	50
ipbx initial dial duration	Timeout in 10 msec units from off-hook to first dialed digit	1500
ipbx warm line duration	Timeout in 10 msec units from off-hook to first dialed digit before warm dial	400
ipbx interdigit duration	Timeout in 10 msec units between digits after dial string already matches a possible pattern	500
ipbx dialing duration	Timeout in 10 msec units after each digit until next digit	1000
ipbx hangup disconnect duration	Hangup disconnect duration in 10 msec units	85
ipbx hangup silence duration	Hangup silence duration in 10 msec units	1000
ipbx pause wait duration	DTMF dial string pause duration in 10 msec units	300
ipbx timeout tone duration	Duration of busy in 10 msec units after aborted dialing or aborted answer (glare)	6000
ipbx timeout pause duration	Pause in 10 msec units between busy and alert tone	100
ipbx timeout warning duration	Duration of alerting tone in 10 msec units when off hook for too long	0
ipbx timeout hold duration	Duration of time in 10 msec units before call holding tone	1000
ipbx timeout hold drop duration	Duration of time in 10 msec units before dropping holding call	6000
ipbx no answer duration	No answer duration in seconds	20
ipbx call back duration	Callback duration in seconds	1800
ipbx call back retry duration	Callback retry duration in seconds	30
ipbx call back ring wait duration	Callback ring wait duration in seconds	1
ipbx message waiting refresh duration	Message waiting refresh duration in seconds	1800

ipbx hookflash maximum	Time in msec for maximum hookflash	900
ipbx hookflash minimum	Time in msec for minimum hookflash	100
ipbx hookflash delay	Time in msec to delay hookflash action in case of hangup	200
ipbx answer hangup delay	Time in msec for answer side hangup delay	0

Other:

Parameter	Description	Default
ipbx concurrent line count	Number of concurrent line permitted	2
ipbx concurrent voip count	Number of concurrent VoIP segments permitted including conferences	3
ipbx epoch clock limit	Call progress, ringer and display synchronization period in samples (16000 for two seconds and 48000 for six seconds)	16000
ipbx hook debounce	Debounce test count for hook on/off transitions	10
ipbx hookflash enable	A parameter added to disable hook flash processing	1

regionalization

The Regionalization settings are used to configure the ATA for local operating conventions. These include:

- Call Progress Tones
- Default Ringing Patterns
- Distinctive Ringing Patterns
- Distinctive Call Waiting Patterns
- LED Patterns and Priority
- Voice and Tone Parameters
- SLAC Configuration
- Command Strings

Call Progress Tones:

Call progress tones are specified by a list of values indicating the number of tones, number of on/off transitions, frequency/signal level pairs and tone on/off times according to the following format:

```
no_of_tones, no_of_times, duration, {tone_element1_freq, tone_element1_db,
tone_element2_freq, tone_element2_db, …}, {tone_on_time1, tone_off_time1, tone_
on_time2, …}
```

- `no_of_tones` is the number of tone elements that are combined to form a tone. Each tone element

has an associated frequency and amplitude. Up to four tone elements can be combined - to form a chord, or played in sequence - as a tune (see no_of_times). A negative no_of_tones indicates that the tones will be synchronized to a two-second timer (relevant for multi-port ATAs only).

• `no_of_times` is the total of both on-to-off and off-to-on transitions in the tone pattern. If this value is positive, it produces a composite tone. If it is negative, the tones are played in sequence. Zero produces a continuous composite tone

• `duration` is the length of time in seconds that the call progress tone will be played. A value of zero means that the tone will be played until instructed otherwise.

• `tone_elementX_freq` and `tone_elementX_db` represent the frequency (Hz) and signal level (dB) of each tone. A negative frequency is used to modulate the prior tone components summed together. A negative dBm level can be offset by ipbx_tone_gain.

• `tone_on_timeX` and `tone_off_timeX` are interleaved Tone On and Tone Off durations in msec. A value of zero for a Tone On time indicates a continuous tone. A value of zero for a Tone Off time produces silence, while a negative value (-1) terminates the tone pattern, removing the silencing. (With silencing, the voice channel is blocked until the tone pattern is stopped.)

Allowed values for frequency are from 0 to 3000Hz. Allowed values for dB levels are from -1 to -40 dB. The maximum number of tones is 4. The maximum number of on-to-off and off-to-on times counted individually is 9.

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or example, the default setting for initial dial tone is `"{2, 0, 0, {350, -19, 440, -19}, {0}}". "2"` is the number of frequency/dB pairs, `"350, -19" and "440, -19". "0"` is the number of on/off transitions in the tone pattern, which means that it is a constant tone. The second `"0"` indicates that the tone will be played until otherwise instructed. The first pair of frequency/dB `"350, -19"` means that the first tone is at 350Hz with a level of -19dB. The second pair `"440, -19"` means that the second tone is at 440Hz with a level of -19dB. The final `"{0}"` means that there are no on/off times and that the tone is constant.

Parameter	Description	Default
ipbx initial dial tone	Initial composite dial tone pattern	{2, 0, 0, {350, -19, 440, -19}, {0}}
ipbx alternate dial tone	Alternate dial tone pattern used with primary VoIP provider not available	{1, 0, 0, {400, -16}, {0}}
ipbx secondary dial tone	Outside line composite dial tone pattern	{2, 0, 0, {420, -19, 520, -19}, {0}}
ipbx stuttered dial tone	Stuttered composite dial tone pattern	{2, 7, 0, {350, -19, 440, -19}, {100, 110, 100, 110, 100, 110, 0}}
ipbx message wait dial tone	Message waiting composite dial tone pattern	{2, 2, 0, {350, -19, 440, -19}, {160, 160}}
ipbx call forward dial tone	Call forward composite dial tone pattern	{2, 3, 0, {350, -19, 440, -19}, {250, 400, 0}}
ipbx pre ringback tone	Pre-ringback tone pattern sequence	{4, -8, 0, {440, -16, 494, -19, 523, -19, 587, -19}, {340, 160, 340, 160, 340, 160, 340, 160}}
ipbx ringback tone	Ringback composite tone pattern	{2, 2, 0, {440, -19, 480, -19}, {2000, 4000}}
ipbx call waiting tone default	Non-blocking call waiting single tone pattern	{1, 2, 0, {440, -16}, {300, 9700}}

ipbx station call waiting tone default	Non-blocking call waiting single tone pattern for station to station calls	{1, 2, 0, {440, -16}, {300, 9700}}
ipbx call holding tone	Non-blocking call holding single tone pattern	{1, 4, 0, {1200, -16}, {100, 200, 100, -1}}
ipbx call hold disconnect tone	Non-blocking call hold disconnect single tone pattern	{1, 4, 0, {350, -16}, {50, 100, 50, -1}}
ipbx call disconnect tone	Call disconnect tone pattern	{2, 2, 0, {480, -19, 620, -19}, {500, 500}}
ipbx call conference tone	Non-blocking conference call tone pattern	{1, 2, 0, {350, -16}, {100, 15000}}
ipbx busy tone	Normal busy composite tone pattern	{2, 2, 0, {480, -19, 620, -19}, {500, 500}}
ipbx reorder tone	Re-order (network/fast busy) composite tone pattern	{2, 2, 0, {480, -19, 620, -19}, {250, 250}}
ipbx off hook warning tone	Off-hook warning composite tone pattern	{4, 2, 0, {1400, 11, 2050, 11, 2450, 11, 2600, 11}, {100, 100}}
ipbx sit1 tone	Sit tone #1 tone sequence	{3, -6, 0, {985, -16, 1428, -16, 1777, -16}, {330, 5, 330, 5, 330, 1000}}
ipbx sit2 tone	Sit tone #2 tone sequence	{3, -6, 0, {914, -16, 1371, -16, 1777, -16}, {330, 5, 330, 5, 330, 1000}}
ipbx sit3 tone	Sit tone #3 tone sequence	{3, -6, 0, {985, -16, 1428, -16, 1777, -16}, {380, 5, 380, 5, 380, 1000}}
ipbx sit4 tone	Sit tone #4 tone sequence	{3, -6, 0, {985, -16, 1428, -16, 1777, -16}, {380, 5, 380, 5, 380, 1000}}
ipbx prompt tone	Prompt composite tone	{2, 0, 0, {520, -19, 620, -19}, {0}}
ipbx confirm tone	Confirmation single tone	{1, 2, 0, {600, -16}, {400, 0}}
ipbx input error tone	Input error composite tone pattern	{2, 2, 0, {480, -19, 620, -19}, {250, 250}}
ipbx number error tone	Number error composite tone pattern	{2, 2, 0, {480, -19, 620, -19}, {250, 250}}

Standard Ringing Patterns:

Ring patterns are specified by a list of values indicating the frequency, number of on/off transitions and Ring On/Ring Off times according to the following format:

`ring_frequency, no_of_times, duration, {ring_on_time1, ring_off_time1, ring_on_time2, ring_off_time2, …}`

- `ring_frequency` specifies the frequency of the ringing tone in Hz for sinusoidal and trapezoidal ring-

ing. This value is only used if the default ringer parameter `slac_ring_frequency` is zero.

• `no_of_times` is the total of both on and off transitions in the ring pattern. This can be zero for a continuous ring signal (which may not be desirable and may exceed the rated power capacity of the ATA).

• `duration` is the length of time in seconds to ring. A value of zero means until instructed otherwise.

• `ring_on_timeX` and `ring_off_timeX` are interleaved Ring On and Ring Off durations in msec. A value of zero for a Ring On time indicates a continuous tone. A value of zero for a Ring Off time produces continuous silence.
Possible values for frequency are between 0-60Hz. The maximum total of on and off times summed together is 9.

Parameter	Description	Default
ipbx call ring default	Default ring pattern	{20, 2, 0, {2000, 4000}}
ipbx call station ring default	Default station call ring pattern	{20, 2, 0, {1000, 3000}}
ipbx call holding rering	Call on hold reminder re-ring pattern	{20, 2, 0, {500, 0}}
ipbx call back ring	Call back success ring pattern	{20, 2, 0, {1500, 0}}
ipbx call back ring splash	Call back in progress ring pattern	{20, 2, 0, {700, 0}}
ipbx call forward ring splash	Call forward reminder ring pattern	{20, 2, 0, {500, 0}}
ipbx message waiting ring splash1	Audible message waiting ring pattern	{20, 2, 0, {500, 0}}

Distinctive Ringing Patterns:
The distinctive ring feature allows a different ring to be sent to the telephone as per the values of the Distinctive Ring parameters 1 - 8. Support for up to 8 distinctive rings is available to the user. The syntax for each of the distinctive ring parameters is the same as the default ring parameter where the frequency, number of On/Off transitions, and the Ring On/Ring Off times can be set as desired.

Parameter	Description	Default
ipbx distinctive ring 1	Distinctive ring pattern #1	{20, 2, 0, {2000, 4000}}
ipbx distinctive ring 2	Distinctive ring pattern #2	{20, 4, 0, {1000, 1000, 1000, 3000}}
ipbx distinctive ring 3	Distinctive ring pattern #3	{20, 6, 0, {300, 200, 1000, 200, 300, 4000}}
ipbx distinctive ring 4	Distinctive ring pattern #4	{20, 4, 0, {800, 400, 800, 4000}}
ipbx distinctive ring 5	Distinctive ring pattern #5	{20, 4, 0, {400, 200, 400, 2000}}
ipbx distinctive ring 6	Distinctive ring pattern #6	{20, 2, 0, {1000, 3000}}
ipbx distinctive ring 7	Distinctive ring pattern #7	{20, 4, 0, {300, 200, 1500, 2000}}
ipbx distinctive ring 8	Distinctive ring pattern #8	{20, 4, 0, {800, 400, 800, 2000}}

Distinctive Call Waiting Patterns:
A distinctive call waiting tone is played when an incoming call arrives while the phone is in use. Support for up to 8 distinctive call waiting tone patterns is available. The syntax for each of the distinctive call waiting tone parameters is the same as the default call waiting tone parameter where the number of tones, number of On/Off transitions, Frequency/Signal level pairs and the tone On/Off times can be set as desired.

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Parameter	Description	Default
ipbx call waiting tone 1	Non-blocking call waiting #1 single tone pattern	{1, 2, 0, {440, -16}, {300, 9700}}
ipbx call waiting tone 2	Non-blocking call waiting #2 single tone pattern	{1, 6, 0, {440, -16}, {100, 20, 100, 20, 100, 9660}}
ipbx call waiting tone 3	Non-blocking call waiting #3 single tone pattern	{1, 4, 0, {440, -16}, {100, 100, 100, 9700}}
ipbx call waiting tone 4	Non-blocking call waiting #4 single tone pattern	{1, 6, 0, {440, -16}, {100, 100, 100, 100, 100, 9500}}
ipbx call waiting tone 5	Non-blocking call waiting #5 single tone pattern	{1, 2, 0, {620, -16}, {300, 9700}}
ipbx call waiting tone 6	blocking call waiting #6 single tone pattern	{1, 6, 0, {620, -16}, {100, 20, 100, 20, 100, 9660}}
ipbx call waiting tone 7	Non-blocking call waiting #7 single tone pattern	{1, 4, 0, {620, -16}, {100, 100, 100, 9700}}
ipbx call waiting tone 8	Non-blocking call waiting #8 single tone pattern	{1, 6, 0, {620, -16}, {100, 100, 100, 100, 100, 9500}}

SLAC Configuration:

Parameter	Description	Default
slac port impedance	Synthetic impedance matching network control for a choice of one in ten common world-wide configurations	600 ohm
slac port rx gain (GR)	SLAC receive gain in dB units	-3
slac port tx gain (GX)	SLAC transmit gain in dB units	6
slac audio clamp	slac caller id type 1 mode Caller ID type 1 (on-hook) mode (None, Belcore MDMF, SDMF, ETSI WINK, ETSI RING and DTMF)	Belcore MDMF
slac caller id type 2 mode	Caller ID type 2 (off-hook) mode (None, Belcore MDMF, SDMF, ETSI WINK, ETSI RING and DTMF)	Belcore MDMF
slac message waiting mode	Message waiting mode (None, Belcore VMWI, ETSI, DTMF)	Belcore VMWI
slac ring type	Selects ring waveform type of sinusoidal or trapezoidal	sinusoidal
slac ring frequency	Ringer frequency in Hz (zero to use ring pattern frequency specification)	
slac ring transition	Trapezoidal transition time in msec	15
slac ring amplitude	Ringer voltage in volts	85

slac ring bias	Ringer bias in volts	0
slac message waiting type	Selects visual message waiting waveform type of sinusoidal or trapezoidal	Sinusoidal
slac message waiting frequency	Visual message waiting frequency in Hz	25
slac message waiting transition	Trapezoidal transition time in msec	15
slac message waiting amplitude	Visual message waiting voltage in volts	50
slac message waiting bias	Visual message waiting bias in volts	0
slac dtmf caller id start code	The parameters 'slac dtmf caller id start code' and 'slac dtmf caller id end code' allow you to configure the start and end codes respectively.	
slac dtmf caller id end code	The parameters 'slac dtmf caller id start code' and 'slac dtmf caller id end code' allow you to configure the start and end codes respectively.	
slac dtmf caller id polarity reversal	DTMF polarity reversal as per ETSI EN 300 659-1: Subscriber line protocol over the local loop for display (and related) services ; Part 1 : On-hook data transmission. The parameter 'slac dtmf caller id polarity reversal' allow you to enable to disable polarity reversal during DTMF caller ID transmission. This function will invert voltage when DTMF tones are transmitted on the analogue interface (Caller Id) before ringing.	Disabled

SLAC Command Strings:

Parameter	Description	Default
slac initialization commands		100
slac impedance commands 1	SLAC commands to synthesize 600 ohm impedance	(many)
slac impedance commands 2	SLAC commands to synthesize 900 ohm impedance	(many)
slac impedance commands 3	SLAC commands to synthesize 600 ohm + 1.0uF impedance	(many)
slac impedance commands 4	SLAC commands to synthesize 900 ohm + 2.16uF impedance	(many)
slac impedance commands 5	SLAC commands to synthesize 270 ohm + 750 ohm || 150nF impedance	(many)

slac impedance commands 6	SLAC commands to synthesize 220 ohm + 820 ohm || 120nF impedance	(many)
slac impedance commands 7	SLAC commands to synthesize 220 ohm + 820 ohm || 115nF impedance	(many)
slac impedance commands 8	SLAC commands to synthesize 370 ohm + 620 ohm || 310nF impedance	(many)
slac impedance commands 9	SLAC commands to synthesize 200 ohm + 680 ohm || 100nF impedance	(many)
slac impedance commands 10	SLAC commands to synthesize 800 ohm + 50nF impedance	(many)

subscription services

Subscription Services configure the ATA for the specific advanced services permitted and/or supported. These include:

- Subscription Services
- Port Configuration

Subscription Service Parameters:

Parameter	Description	Default
ipbx call waiting service	Enables customer use of call waiting service	Enabled
ipbx caller id inbound service	Enables customer use of incoming caller ID service	Enabled
ipbx caller id outbound service	Enables customer use of outgoing caller ID service (i.e. always send caller ID information)	Enabled
ipbx call waiting caller id service	Enables customer use of incoming caller ID during call waiting service	Enabled
ipbx call back service	Enables customer use of call back service	Enabled
ipbx call return service	Enables customer use of call return service	Enabled
ipbx speed dial service	Enables customer use of speed dial service	Enabled
ipbx do not disturb service	Enables customer use of do not disturb service	Enabled
ipbx block anonymous service	Enables customer use of anonymous call block service	Enabled
ipbx call forward service	Enables customer use of call forward service	Enabled

ipbx busy forward service	Enables customer use of call forward when busy service	Enabled
ipbx no answer forward service	Enables customer use of no answer call forward service	Enabled
ipbx priority forward service	Enables customer use of priority call service	Enabled
ipbx distinctive ring service	Enables customer use of distinctive ring service	Enabled
ipbx disturb accept service	Enables customer use of do not disturb accept service	Enabled
ipbx blocked number service	Enables customer use of blocked number service	Enabled
Ipbx outgoing block number service	Enables outgoing block service	Enabled
ipbx forward last call service	Enables customer use of forward to last caller service	Enabled
ipbx distinctive ring last call service	Enables customer use of distinctive ring for last caller service	Enabled
ipbx disturb accept last call service	Enables customer use of do not disturb accept last caller service	Enabled
ipbx block last call service	Enables customer use of block last caller service	Enabled
ipbx three way calling service	Enables customer use of three way calling service	Enabled
ipbx three way conference service[3]	Enables customer use of three way conference service	Enabled
ipbx attended transfer service	Enables customer use of attended call transfer service	Enabled
ipbx unattended transfer service	Enables customer use of unattended call transfer service	Enabled
ipbx message waiting service	Enables customer use of message waiting service	Enabled
ipbx visual message waiting service	Enables customer use of visual message waiting service. If enabled the ATA will send FSK data to the phone indicating the presence or non-presence of a message. The ATA supports the Belcore SDMF and Belcore MDMF standards of visual message waiting indication	Enabled
ipbx remote feature code service	Enables sending all features codes to remote service provider	Disabled
ipbx default feature code service	Enables sending all unprocessed feature codes to remote service provider	Disabled

Port Configuration:

Parameter	Description	Default
ipbx line 1 enable	Enables use of physical line 1	Enabled
ipbx line 2 enable	Enables use of physical line 2	Enabled

ipbx line 1 number	Assigned local number for line 1	L1
ipbx line 2 number	Assigned local number for line 2	L2
ipbx line 1 name	Assigned name for line 1	(Empty)
ipbx line 2 name	Assigned name for line 2	(Empty)

[3] As far as conferencing goes, the ATA can handle two simultaneous media connections. If both ports are in use, local conferencing inside the ATA is not possible.

If three way conferencing is enabled:

Scenario 1 (while in call):

1. Hookflash puts current call on hold.
2. Dial and connect second call.
3. Hookflash conferences the calls together.

4a. Hookflash hangs up the second call.

or

4b. Hanging up will transfer the 2 remote calls together (attended transfer).

Scenario 2 (while in call):

1. Incoming call received (call waiting).
2. Hookflash to accept call waiting call.
3. Hookflash to switch back to first call.
4. Hookflash to switch back and forth between calls.

Scenario 3 (while in call and local processing of feature codes is enabled):

1. Hookflash puts current call on hold.
2. Dial *98 followed by a phone number.
3. Current call will be transferred to number dialed in step 2 (blind transfer).

The difference between scenarios 1 and 2 is the direction of the second call. In scenario 1 the second call was an outgoing call from the ATA. In this case the ATA is able to conference the two calls together. In scenario 2 the second call was incoming to the ATA. In this case conferencing is not available. If three way conferencing is disabled the behavior is the same as scenario 2 regardless of whether the second call was incoming or not (i.e. hookflashing will switch between the two active calls).

Operating Mode:

Parameter	Description	Default
ipbx mode	ATA operating mode (ASS, SIHT, IHT, SIOT, IPBX)ASS (A Simple Service): The simplest mode passes all digits, as well as * and #, to the pattern matches for VOIP or PSTN calls. In this mode there is absolutely no feature codes, speed dialing or manual call routing. SIHT (Simple Internet Home Termination): This mode provides dialing priority for a VoIP call and almost eliminates all special codes for access to other stations. This is best used for a maximum of 2 to 4 stations. The most significant simplification is for placing a call on hold and picking it up. No transfer/pickup codes are needed. Picking up both lines conferences them together. A line may press * or # to get a new line to place their own call. Very limited feature sequences are needed. IHT (Internet Home Termination): This mode provides dialing priority for a VoIP call and requires special codes for access to other stations. This can be scaled from 2 to 8 stations (and possibly more by increasing the number of digits used for station identification). SIOT (Small Internet Office Termination): This mode is a simplified IBX/enhanced IHT IPBX (Internet Private Branch Exchange): This mode provides dialing priority for station-to-station calls and requires dialing 8 or 9 to place PSTN and VoIP calls. This can be scaled from 2 to 99 (or 999) stations with the use of more digits for station identification. SIHT, value '1'	
ipbx voip primary provider unavailable	Dial tone to be generated when the primary provider is not available	Standard Dial Tone
ipbx voip no provider available	Dial tone to be generated when all VoIP providers are not available	Alternate Dial Tone
ipbx pstn not available	Dial tone to be generated when no VoIP provider is available and no PSTN dial tone is available	No Dial Tone
ipbx dial direct	Direct dial processing mode (VoIP, PSTN, BOTH or DIRECT)	BOTH
ipbx dial after 8	Processing mode after an 8 prefix (VoIP, PSTN, BOTH or DIRECT)	PSTN
ipbx dial after 9	Processing mode after a 9 prefix (VoIP, PSTN, BOTH or DIRECT)	VoIP
ipbx dial after pound 8	Processing mode after a #8 prefix (VoIP, PSTN, BOTH or DIRECT)	BOTH
ipbx dial after pound 9	Processing mode after a #9 prefix (VoIP, PSTN, BOTH or DIRECT)	BOTH
ipbx dial speed dial	Processing mode for speed dial (VoIP, PSTN, BOTH or DIRECT)	VoIP

ipbx input pattern voip	Pattern match for VoIP dialing	[3469]11|*xx|**| 1900r7x!| 976r4!| 1800r7x|[^1] r6x| 1r3x[^1]r6x| 1010Se#e*p2r*x| 0Se#e*p2r*x
ipbx input pattern pstn	Pattern match for PSTN dialing	911
ipbx hot line dialing	Enables automatic hot-line dialing	Disabled
ipbx warm line dialing	Enables shorter duration timeout for warm line dialing	Disabled
ipbx hotwarm dial string	Hot/warm dial string	(empty)
ipbx polarity dialing	Sets the SLAC line polarity during dialing (forward or reverse)	Forward
ipbx polarity dial done	Sets the SLAC line polarity after dialing is done (forward or reverse)	Forward
ipbx polarity connect	Sets the SLAC line polarity during connect (forward or reverse)	Forward
ipbx polarity answer	Sets the SLAC line polarity during answer (forward or reverse)	Forward
ipbx polarity idle	Sets the SLAC line polarity during idle (forward or reverse)	Forward
lpbx party line enable	Enables the two lines to be bridged with the use of hock flash	Disabled

VoIP Dial Pattern:

The VoIP Dial Pattern and the PSTN Dial Pattern together determine how the ATA handles dial strings when someone dials a number from an attached phone. For units without an FXO port, the PSTN Dial Pattern is ignored. In a given location, there are generally only a few types of dialed numbers that need to be defined. There is dialing for local calls, there is dialing for domestic toll calls, and there is dialing for international toll calls. In addition, there are specific short strings that are set aside for emergency dialing, and there may be other special strings that invoke telephone features.

By default, the ATA is configured to handle number patterns in every country in the world. For models with an FXO port, emergency calls are by default routed to the PSTN, and all other calls are routed via VoIP. You can use the Dial Patterns to change which calls are sent via VoIP, and which are sent to the PSTN. For example, you may want to send all local calls via the PSTN, because these may be free on your PSTN line. You may also want to tailor the Dial Patterns to precisely reflect the format of telephone numbers in your location. For example, the default configuration recognizes that a local number may be from 5 to 10 digits long. If local numbers are always 8 digits, this means that the ATA will wait a few seconds after the 8th digit has been dialed, to see if any digits follow. You could redefine the local dial string always to expect 8 digits, and to immediately send the number to the service provider once someone had dialed 8 digits.

Parameter	Description
"|"	separates different possible patterns
"r"	repeat by following a number (1-9), letter (a-z for 10 to 35 times) or "*", "+" or "." to mean any number of times (255 times)
"."	repeat previous digit any number of times (0 to 255)

“+”	repeat previous digit any number of times (0 to 255)
“x”	match any numerical digit (0-9)
“~”	match any digit (0-9, A-D, *, #) excluding any specified terminators
“!”	disallows pattern
“$”	indicates secondary dialing to follow - used only by fixed dial strings
“<:>”	replace group to replace left digit(s) with right digit(s)
“[]”	selection group of candidate digits
“[^]”	exclusion group of digits
“[0-9]”	selection range of candidate numerical digits
“[a-d]”	selection range of candidate letter digits
“s”	seize on string as only candidate if match to this point
“e”	specify ending termination digit which follows (usually * or #)
“f”	pause timeout causes failure instead of dial
“p”	set digit pause to number of seconds which follow (1-9) for current pattern
“t”	set digit timeout to default for current pattern
“-”	human readable spacing which is ignored

Interdigit timeout, or pause: By default, the device allows five (5) seconds between dialed digits. To change this default, you must insert the “p” parameter before the point in the match string that you want this parameter to change. For example, if you would like a nine (9) second delay after each digit is pressed, then you would need to enter “p9” at the beginning of the pattern matching string. Similarly, if you would like a shorter timeout of three (3) seconds towards the end of a dial string, you would need to enter “p3” before the last entry in the pattern matching string: …p3r*x.

Examples of dial strings:

Each parameter in a pattern match string represents a single digit. The only exceptions are parameters that include a repeat operator. We will illustrate these features by examining the entries in the default VoIP dial string:

```
[346]11|*xx|**[1-9]e#r5xp3r*x|p8[1-9]e#r5xp3r*x|#[1-9]e#r5xp3r*x |1010Se#p2r*x|
0Se#r5xp2r*x[3469]11
```

Recognize the sequences `311,411, 611` and `911`, and send them to the service provider when complete.
`[3469]` means “either 3 OR 4 OR 6 OR 9” . The entire string means “either 3 OR 4 OR 6 OR 9” followed by `“11”`.

`*xx`
This string allows the ATA to recognize and forward feature codes to the service provider. However, note that by default, feature codes are handled locally, in the ATA. The ATA refers to this string only if the remote or default feature code parameters are enabled, or if Pass Through mode is enabled. In those cases, this string must be included in the pattern matching string, so that the ATA will forward feature codes to the service provider.

**[1-9]e#r5xp3r*x
This string pertains to VoIP provider “area codes”. The “***” prefix is a signal for the service provider to forward this call to another VoIP service provider. The three digits following “***” constitute the VoIP provider “area code.” Recognize a string starting with “***”, and proceeding with any of the digits 1-9. “e#” defines “#” as the terminating character. If someone dials “#” at any point after the 1-9, the ATA sends out all digits dialed to that point to the service provider. If the person doesn’t dial a “#”,collect five more digits (“’r5x”), switch from the default inter-digit timeout of five (5) seconds to a shorter inter-digit timeout of three (3) seconds (“p3”), and continue collecting digits until a timeout occurs (“r*x”). This string will be forwarded only if the ATA is in Pass Through Mode.

p8[1-9]e#r5xp3r*x
This is the workhorse string of the default pattern for dialing. It matches dialing for VoIP calls, and for local dialing in most countries. It also matches dialing for domestic long distance dialing under the North American dial plan. This string is identical to the preceding string, except for the first two characters. Where the preceding string calls for a match to the prefix “***”, this string redefines the interdigit timeout. This value has been increased to eight (8) seconds. This timeout value persists until the first digit plus five other digits have been collected, at which time the timeout value is reduced to three (3) seconds. From that point onward, the ATA continues to collect digits until the user pauses three seconds, at which point, the ATA sends the dialed string to the service provider.

#[1-9]e#r5xp3r*x
This string is identical to the previous two, except for the first digit. This string supports cases where service providers use strings that start with “#” for various special features or control purposes. This string is forwarded to the service provider only if the Mode is set to Pass Through.

1010Se#p2r*x
This string is included to supported cases where North-American style dial-around dialing is available. The “S” means that if someone dials 1010 as the first four digits of a dial string, this is the only string the ATA should match to from that point on. “e#” means that the user can indicate the completion of dialing at any time by entering “#”. “p2” means that after someone dials 1010, the timeout between subsequent digits is reduced to two (2) seconds. “r*x” means that the ATA will continue to collect dialed digits until there is a timeout.

0Se#r5xp2r*x
This is the second workhorse string of the default pattern matching string. International calls in almost every country, and domestic long distance calls in most countries outside North America, all match this pattern. Any number that starts with zero (0) matches this string. The user may dial # at any time to indicate the number dialed is complete. After the user dials the sixth digit, the inter-digit timeout is reduced to two seconds. After that point, the ATA continues to collect digits until the user pauses two seconds. Then the ATA sends the dialed string to the service provider.

user configuration

ATA settings made by the user include:

- Speed Dials
- Call Forwarding
- Message Waiting
- Timers
- Distinctive Ringing
- Do Not Disturb
- Call Blocking
- Call Waiting/Caller ID

Speed Dial:

The Speed Dial List can be modified by the telephone or via the web pages. Up to 28 numbers can be entered into the Speed Dial List. Each number can be up to 40 digits in length.

Parameter	Description	Default
ipbx speed dial array *20	Speed dial number corresponding to *20	(empty)
(repeated)		
ipbx speed dial array *39	Speed dial number corresponding to *39	(empty)
ipbx speed dial array #0	Speed dial number corresponding to #0	(empty)
(repeated)		
ipbx speed dial array #7	Speed dial number corresponding to #7	(empty)
ipbx hot warm dial string	Special number to be dialed when phone is picked up	(empty)

Call Forwarding:
With Call Forward enabled, any call on this list will be forwarded to the number stored in the Call Forward List (1-12). Up to thirty 40-digit numbers can be entered.

Parameter	Description	Default
ipbx call forward enable	All call forward enable	Disabled
ipbx busy forward enable	Busy call forward enable	Disabled
ipbx no answer forward enable	No answer call forward enable	Disabled
ipbx priority forward enable	Priority call forward enable	Disabled
ipbx call forward dial string	Call forward destination	(empty)
ipbx busy forward dial string	Busy call forward destination	(empty)
ipbx no answer forward dial string	No answer call forward destination	(empty)
ipbx priority forward dial string	Priority call forward destination	(empty)
ipbx call forward list 1	Number to forward entry 1	(empty)
(repeated)		
ipbx call forward list 30	Number to forward entry 30	(empty)

Distinctive Ringing:

Parameter	Description	Default
ipbx distinctive ring enable	Allows numbers on Distinctive Ring List to ring with a distinctive pattern	Enabled
ipbx distinctive ring list 1	Number for distinctive ringing entry 1	(empty)
(repeated)		
ipbx distinctive ring list 30	Number for distinctive ringing entry 30	(empty)

Do Not Disturb:

Parameter	Description	Default
ipbx do not disturb mode	Enables Do Not Disturb Mode	Disabled

ipbx disturb accept enable	Enables only calls on the Disturb Accept List to ring	Disabled
ipbx disturb accept list 1	Number to accepted while in do not disturb state entry 1	(empty)
(Repeated)		

Call Blocking:

Parameter	Description	Default
ipbx block anonymous enable	Blocks anonymous numbers	Disabled
ipbx blocked number enable	Enables blocking of calls from numbers in the Blocked Number List	Disabled
ipbx blocked number list 1	Numbers to block entry 1	(empty)
(repeated)		
ipbx blocked number list 30	Numbers to block entry 30	(empty)

Outgoing Call Blocking:

Parameter	Description	Default
ipbx outgoing block enable	Enables outgoing blocking of calls from numbers in the Blocked Number List	Disabled
ipbx outgoing block number list 1	Numbers to block entry 1	(empty)
(repeated)		
ipbx outgoing block number list 30	Numbers to block entry 30	(empty)

Call Waiting/Caller ID:

Parameter	Description	Default
ipbx call waiting enable	Enables call waiting for all calls	Enabled
ipbx caller id inbound enable	Enables caller ID for inbound calls	Enabled
ipbx caller id outbound enable	Enables caller ID for outbound calls	Enabled
ipbx caller id waiting enable	Enables caller ID during call waiting	Disabled

Message Waiting:

Parameter	Description	Default
ipbx message waiting	Enables message waiting indica-tion	Off

feature code assignments (55 - 99)

The IPBX calling features are assigned the ranges *55 to *89 and *92 to *99. The codes can be reassigned to better match common local conventions, but they must be given codes within the assigned ranges.

Parameter	Description	Default
ipbx fc call waiting enable	Enable call waiting on all calls	55
ipbx fc call waiting disable	Disable call waiting on all calls	56
ipbx fc call trace	Call trace (reserved)	57
ipbx fc call waiting caller id enable	Enable call waiting caller ID generation	58
ipbx fc call waiting caller id disable	Disable call waiting caller ID generation	59
ipbx fc blocked number enable	Enable call blocking feature	60
ipbx fc distinctive ring enable	Enable distinctive ringing feature	61
ipbx fc caller id outbound disable	Block caller ID on all outbound calls	62
ipbx fc priority forward enable	Enable priority call forwarding feature	63
ipbx fc disturb accept enable	Enable do not disturb accept call feature	64
ipbx fc caller id inbound enable	Enable caller ID generation	65
ipbx fc busy number redial	Busy number redial	66
ipbx fc caller id outbound enable once	Unblock caller ID for one call	67
ipbx fc caller id outbound disable once	Block caller ID for one call	68
ipbx fc caller redial	Call the last caller	69
ipbx fc call waiting disable once	Deactivate call waiting for current call	70
ipbx fc call waiting enable once	Enable call waiting for current call	71
ipbx fc call forward enable	Enable call forwarding to number which follows	72
ipbx fc call forward disable	Cancel call forwarding of non-priority calls	73
ipbx fc one digit speed dial program	Program speed dials 2-9 (20-39 implemented)	74
ipbx fc two digit speed dial program	Program speed dials 20-49 (20-39 implemented)	75
ipbx fc block anonymous enable	Block all anonymous calls	77
ipbx fc do not disturb enable	Enter do not disturb state	78
ipbx fc do not disturb disable	Exit do no disturb state	79
ipbx fc blocked number disable	Cancel call lock - remove optional number from blocked call list, or disable call blocking feature	80
ipbx fc distinctive ring disable	Disable distinctive ringing	81
ipbx fc caller id outbound enable	Unblock caller ID on all outbound calls	82
ipbx fc priority forward disable	Cancel priority call forward	83
ipbx fc disturb accept disable	Disable do not disturb accept call feature	84
ipbx fc caller id inbound disable	Disable caller ID generation	85
ipbx fc busy number redial cancel	Cancel busy redial	86
ipbx fc block anonymous disable	Unblock anonymous calls	87
ipbx fc hookflash simulation		88
ipbx fc caller redial cancel	Cancel calling last caller	89

ipbx fc no answer forward enable	Call forward when no answer - number follows	92
ipbx fc no answer forward disable	Cancel call forward when no answer	93
ipbx fc busy forward enable	Call forward when busy - number follows	94
ipbx fc busy forward disable	Cancel call forward when busy	95
ipbx outgoing block enable		96
ipbx outgoing block disable		97
ipbx fc unattended transfer		98

built-in wifi (for 79615 and 79616)

Important:
The Wifi Access Point uses the LAN port 1 as interface, so all CPE switch related settings made for LAN port 1 will be applicable to this interface. 79615 and 79616 do not have LAN port 1 available for other services than wifi.

tftp based provisioning

The Wifi Access Point will get its configuration via a TFTP request initiated by the CPE, when the module is present and enabled.

The module is enabled using the following command in the CPE configuration script.

```
enable_wifi <host-wifi-setup-filename> [-t optional-TFTP-server-IP] [-p option-
alpassword] [-w optional-WiFi-IP-address]

# The default password for the admin user is “admin”. If the password is
changed, this new password may be supplied as the second parameter on the com-
mand line. The default IP address of the wifi module is 192.168.1.250. If this
is changed, then both the password and the correct IP address must be supplied
on the command line. The default TFTP server is the same as used for the CPE
configuration file.
```

system parameters

Configuration of the Wifi Access Point is done with the use of a configuration file, including the following parameters, please refer to Appendix 2 – Wifi configuration file for details.

Parameter	Description	Default
Default	Do not touch	-
WebInit	Do not touch	1

HostName	Wifi host name	DKTCOMEGA
Login	Administrator configuration access name, Please consult DKTCOMEGA for user name and password	*********
Password	Administrator password, Please consult DKTCOMEGA for user name and password	*********
OperationMode	Wifi Operation Mode The following modes can be configured - Access Point (0) - Router (1) - AP Client (2)	0
Platform	Wifi Module Platform, chip vendor	RT3050
wanConnectionMode	WAN Connection Type	DHCP
wan_ipaddr	Applicable to Router Operation Mode, WAN IP address	192.168.2.1
wan_netmask	applicable to Router Operation Mode, IP Subnet mask	255.255.255.0
wan_gateway	applicable to Router Operation Mode, IP Address of the WAN Gateway	192.168.2.254
wan_primary_dns	applicable to Router Operation Mode, DNS Server, primary	168.95.1.1
wan_secondary_dns	applicable to Router Operation Mode, DNS Server, secondary	168.95.192.1
wan_pppoe_user	applicable to Router Operation Mode, PPPoE Username	pppoe_user
wan_pppoe_pass	applicable to Router Operation Mode, PPPoW password	pppoe_passwd
wan_l2tp_server	applicable to Router Operation Mode, Server IP Address	l2tp_server
wan_l2tp_user	applicable to Router Operation Mode, Username	l2tp_user
wan_l2tp_pass	applicable to Router Operation Mode, Password	l2tp_passwd
wan_l2tp_mode	applicable to Router Operation Mode, Mode of Operation	0
wan_l2tp_ip	applicable to Router Operation Mode, IP Address of the Wifi	192.168.2.1
wan_l2tp_netmask	applicable to Router Operation Mode, Subnet mask of the Wifi	255.255.255.0
wan_l2tp_gateway	applicable to Router Operation Mode, IP Address of the Gateway	192.168.2.254
wan_pptp_server	applicable to Router Operation Mode, Point-to-point tunneling protocol, Server IP Address	pptp_server
wan_pptp_user	applicable to Router Operation Mode, Point-to-point tunneling protocol, Username	pptp_user
wan_pptp_pass	applicable to Router Operation Mode, Point-to-point tunneling protocol, Password	pptp_passwd
wan_pptp_mode	applicable to Router Operation Mode, Point-to-point tunneling protocol, Mode of Operation	0

wan_pptp_ip	applicable to Router Operation Mode, Point-to-point tunneling protocol, IP Address of the Wifi	192.168.2.1
wan_pptp_netmask	applicable to Router Operation Mode, Point-to-point tunneling protocol, Subnet mask of the Wifi	255.255.255.0
wan_pptp_gateway	applicable to Router Operation Mode, Point-to-point tunneling protocol, IP Address of the Gateway	192.168.2.254
lan_ipaddr	LAN IP Address of the Wifi	192.168.1.250
lan_netmask	Subnet mask of the Wifi	255.255.255.0
dhcpEnabled	DHCP Server functionality, Enable or Disable. Clients connected to the Wifi will get their IP Addressed by the Wifi.	0 (Disable)
dhcpStart	Applicable to DHCP Enable, Start IP Address in the range	192.168.1.100
dhcpEnd	Applicable to DHCP Enable, Stop IP Address of the rante	192.168.1.200
dhcpMask	Applicable to DHCP Enable, Subnet mask	255.255.255.0
dhcpPriDns	Applicable to DHCP Enable, Primary DNS Server IP Address	168.95.1.1
dhcpSecDns	Applicable to DHCP Enable, Secondary DNS Server IP Address	168.95.192.1
dhcpGateway	Applicable to DHCP Enable, IP Address of the Gateway	192.168.1.250
dhcpLease	Applicable to DHCP Enable, this is the DHCP lease time. When it is short, the issued IP address to DHCP clients will be updated frequently. It is recommended to keep default setting except for another purpose	86400 (24 hrs)
stpEnabled	Spanning Tree	0
lltdEnabled	Link Layer Topology Discovery, Enable or Disable	0
igmpEnabled	IGMP functionality, Enable or Disable	0
natEnabled	NAT functionality, Enable or Disable	1
IPPortFilterEnable	IP based port filtering, Enable or Disable	0
IPPortFilterRules	IP based port filtering, Rules	-
PortForwardEnable	Port Forwarding, Enable or Disable	0
PortForwardRules Port	Forwarding, Rules	-
MacFilterEnable	MAC Filtering, Enable or Disable	-
MacFilterRules	MAC Filtering, Rules	-
DefaultFirewallPolicy		1
DMZEnable	De-Militarized Zone, Enable or Disable	0
DMZIPAddress	Input the IP Address of the computer that you want to expose to Internet.	-
TZ		-
NTPServerIP	IP Address of the NTP Server	-
NTPSync		-

DDNSProvider		-
DDNS		-
DDNSAccount		-
DDNSPassword		-
BssidNum		4
SSID1	This device supports multiple SSID. Input the multiple SSID 1, 2, 3 in the field to enable the function. With the field of Network Name (SSID), the device supports maximum 4 SSIDs.	DKTCOMEGA1
WirelessMode		9
TxRate		0;0;0;0
Channel		6
BasicRate		15
BeaconPeriod	Beacons are the packets sending by Access point to synchronize the wireless network. The beacon interval is the time interval between beacons sending by this unit in AP or AP+WDS mode. The default and recommended User's Guide 29 beacon interval is 100 milliseconds	100
DtimPeriod	This is the Delivery Traffic Indication Map. It is used to alert the clients that multicast and broadcast packets buffer at the AP will be transmitted immediately after the transmission of this beacon frame. You can change the value from 1 to 255. The AP will check the buffer data according to this value. For example, selecting "1" means to check the buffer data at every beacon.	1
TxPower		100
RxAckTimeout	The Acknowledgement Timeout means from remote to local data transmission, one parameter to control both acknowledging action to guaranty those packets have already be received. Usually, for short distance, keep default setting is proposed. If there is long distance application, have minor increased with this parameter will be proposed.	32
DisableOLBC		0
BGProtection	Default: Auto. You can select the other options including On and Off. The B/G protection technology is CTS-To-Self. It will try to reserve the throughput for 11bg clients association.	0
TxAntenna		-
RxAntenna		-
TxPreamble		0

RTSThreshold	The RTS threshold determines the packet size at which the radio issues a request to send (RTS) before sending the packet. A low RTS Threshold setting can be useful in areas where many client devices are associating with the device, or in areas where the clients are far apart and can detect only the device and not each other. You can enter a setting ranging from 0 to 2347 bytes.	2347
FragThreshold	The fragmentation threshold determines the size at which packets are fragmented (sent as several pieces instead of as one block). Use a low setting in areas where communication is poor or where there is a great deal of radio interference. This function will help you to improve the network performance.	2346
TxBurst	The device will try to send a serial of packages with single ACK reply from the clients. Enable this function to apply it.	1
PktAggregate		1
TurboRate		0
StaLimitationEnable		0
StaLimitationNum		0
WmmCapable	Choose “Enable” to enable WMM (Wi-Fi Multimedia) function.	1;1;1;1
APAifsn		3;7;1;1
APCwmin		4;4;3;2
APCwmax		6;10;4;3
APTxop		0;0;94;47
APACM		0;0;0;0
BSSAifsn		3;7;2;2
BSSCwmin		4;4;3;2
BSSCwmax		10;10;4;3
BSSTxop		0;0;94;47
BSSACM		0;0;0;0
AckPolicy		0;0;0;0
APSDCapable	Choose “Enable” to enable APSD (Automatic Power-Save Delivery) function.	0
DLSCapable		0
NoForwarding		0;0;0;0
NoForwardingBTNBSSID		0
HideSSID		0;0;0;0
ShortSlot		1
AutoChannelSelect=0		0
SecurityMode	OPEN, SHARED, WEPAUTO, WPA RADIUS, WPA-PSK, WPA2 RADIUS, WPA2-PSK, WPA/WPA2 PSK, WPA/WPA2 RADIUS, 802.1X.	0

VLANEnable	VLAN Support, Enable or Disable	0
VLANName	VLAN name	-
VLANID	VLAN VID	0
VLANPriority	VLAN priority	0
WscConfMode		0
WscConfStatus	It shows the current status of the WPS process.	2
WscAKMP		1
WscConfigured	It indicated whether the WPS is configured.	1
WscModeOption		0
WscActionIndex		9
WscPinCode	Input the 8-digits PIN of client.	-
WscRegResult		1
WscUseUPnP		1
WscUseUFD		0
WscSSID		DKTCOMEGAAP
WscKeyMGMT		WPA-EAP
WscConfigMethod		138
WscAuthType		1
WscEncrypType		1
WscNewKey		Scaptest
IEEE8021X		0;0;0;0
IEEE80211H		0
CSPeriod		6
PreAuth		0;0;0;0
AuthMode	WPAPSK;OPEN;OPEN;OPEN	
EncrypType	TKIP;NONE;NONE;NONE	
RekeyInterval		3600
RekeyMethod		DISABLE
PMKCachePeriod		10
WPAPSK1	WPA/WPA2-PSK Pass Phrase (8-64 characters). Key 2	56655153
DefaultKeyID		2;1;1;1
Key1Type		0;0;0;0
Key1Str1		-
Key2Type		0;0;0;0
Key2Str1		-
Key3Type		0;0;0;0
Key3Str1		-
Key4Type		0;0;0;0
Key4Str1		-
HSCounter		0
HT_HTC	Applicable to HT Physical Mode	1

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HT_RDG	Applicable to HT Physical Mode, Reverse Direction Grant (RDG). This is the 11n performance parameter. Enable it if needed.	1
HT_LinkAdapt	Applicable to HT Physical Mode	0
HT_OpMode	Applicable to HT Physical Mode	0
HT_MpduDensity	Applicable to HT Physical Mode	5
HT_EXTCHA	Applicable to HT Physical Mode	1
HT_BW	Applicable to HT Physical Mode	1
HT_AutoBA	Applicable to HT Physical Mode, Auto Block ACK. It is another aggregation technique which prevents sending ACK in the communication to increase the throughput. If this option is enabled, the device will activate this function when transmitting massive data.	1
HT_BADecline	Applicable to HT Physical Mode, Decline BA Request, Enable this option to decline the Block ACK request addressed by the other devices.	0
HT_AMSDU	Applicable to HT Physical Mode, Aggregation MSDU (A-MSDU). The multiple HT packets can be transmitted with single ACK reply packet. Enable it to apply this function and reduce the network congestion.	0
HT_BAWinSize	Applicable to HT Physical Mode	64
HT_GI	Applicable to HT Physical Mode	1
HT_STBC	Applicable to HT Physical Mode	1
HT_MCS	Applicable to HT Physical Mode	33;33;33;33
HT_PROTECT	Applicable to HT Physical Mode	1
HT_MIMOPS	Applicable to HT Physical Mode	3
HT_40MHZ_INTOLERANT	Applicable to HT Physical Mode	0
HT_TxStream	Applicable to HT Physical Mode	2
HT_RxStream	Applicable to HT Physical Mode	2
NintendoCapable		0
AccessPolicy0		0
AccessControlList0		-
AccessPolicy1		0
AccessControlList1		-
AccessPolicy2		0
AccessControlList2		-
AccessPolicy3		0
AccessControlList3		-
WdsEnable	This device supports “Access Point”, “AP allows WDS”, “Bridge” and “Repeater”. When selecting “Bridge”, this device provides WDS connection only and doesn’t provide radio to the WLAN stations (clients). To provide both AP and WDS connections, select “Repeater”.	0

WdsPhyMode	There are four modes including “CCK, OFDM, HTMIX, and Greenfield”. Select one according the WDS devices. The CCK is for pure 802.11b WDS network. OFDM is for pure 802.11g WDS network. HTMIX is for 802.11 g/n WDS network. Greenfield is for pure 802.11n WDS network.	
WdsEncrypType	There are 4 types to support, NONE,WEP,TKIP,AES	NONE
WdsList		-
WdsKey	Please input the key for encryption	-
WirelessEvent		0
RADIUS_Server	Input the IP Address of the Radius server	0;0;0;0
RADIUS_Port	Input the port of the Radius server. The default port is 1812.	1812;1812;1812;1812
RADIUS_Key	Authentication Key	DKTCOMEGA;DKTCOMEGA;DKTCOMEGA;DKTCOMEGA
RADIUS_Acct_Server		-
RADIUS_Acct_Port		1813
RADIUS_Acct_Key		-
session_timeout_interval	maximum idle time for this connection	0
idle_timeout_interval		0
staWirelessMode		9
RemoteManagement	Remote management (via WAN): you can select “Deny” or “Allow” to decide whether the WAN of the device can be accessed. If it isn’t accessible, then you can’t open the web page from WAN.	1
WAN_MAC_ADDR	MAC Address of the WAN interface	
RFICType		5
TXPath		5
RXPath		1
SSID2	This device supports multiple SSID. Input the multiple SSID 1, 2, 3 in the field to enable the function. With the field of Network Name (SSID), the device supports maximum 4 SSIDs.	DKTCOMEGA2
SSID3	This device supports multiple SSID. Input the multiple SSID 1, 2, 3 in the field to enable the function. With the field of Network Name (SSID), the device supports maximum 4 SSIDs.	DKTCOMEGA3
SSID4	This device supports multiple SSID. Input the multiple SSID 1, 2, 3 in the field to enable the function. With the field of Network Name (SSID), the device supports maximum 4 SSIDs.	
		DKTCOMEGA4
WPAPSK2	WPA/WPA2-PSK Pass Phrase (8-64 characters). Key 2	12345678
Key1Str2		-
Key2Str2		-
Key3Str2		-
Key4Str2		-

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WPAPSK3	WPA/WPA2-PSK Pass Phrase (8-64 characters). Key 3	12345678
Key1Str3		-
Key2Str3		-
Key3Str3		-
Key4Str3		-
WPAPSK4	WPA/WPA2-PSK Pass Phrase (8-64 characters). Key 4	12345678
Key1Str4		-
Key2Str4		-
Key3Str4		-
Key4Str4		-
FixedTxMode		HT;HT;HT;HT

appendix 1 – ata configuration file

Please notice that the ATA supports provisioning of the configuration file in both clear text as well as in encrypted format. Default is clear text, if encrypted format is preferred, please consult DKTCOMEGA for further details.

```
# Accounts
ata_service_name&3c0=DKTCOMEGA
ata_factory_name&300=Factory
ata_factory_password&300=1L60U5DdLQjh8DehGxpTCQ=
ata_admin_name&3c0=Administrator
ata_admin_password&3c0=VPxOk773305H+qh0NTnL1g=
ata_user_name&3d0=Username
ata_user_password&3d0=9oYkq64Q6wBNAg+FhkKrSw=
ata_factory_lock_bypass_enable&300=0
ata_user_message&3f0=Thank you for purchasing this DKT ATA
ata_user_email&310=
# Date/Time
ata_date&3d0=1970/1/1
ata_time&3d0=01:27:19
ata_time_zone&3dc=-5
ata_daylight_savings_enable&3dc=1
ata_timeserver_enable&3d0=1
ata_timeserver_domain_name&3dc=time-a.nist.gov
# Network Device Configuration
net_assigned_router_name&3d0=DKT_ATA
net_assigned_host_name&3d0=DKT_ATA
net_assigned_domain_name&3d0=
net_assigned_mtu&3d0=1492
net_assigned_cloned_mac_address&3d0=
# Router Command Strings
net_router_commands_&3d0=
_net_router_commands_1&3d0=
_net_router_commands_2&3d0=
_net_router_commands_3&3d0=
_net_router_commands_4&3d0=
_net_router_commands_5&3d0=
```

```
_net_router_commands_6&3d0=
_net_router_commands_7&3d0=
_net_router_commands_8&3d0=
_net_router_commands_9&3d0=
_net_router_commands_10&3d0=
# Static Network Configuration
net_static_config_enable&3dc=0
net_static_ip_address&3dc=0.0.0.0
net_static_netmask&3dc=255.255.255.0
net_static_gateway_address&3dc=0.0.0.0
# DNS Configuration
net_dns_primary_address&3dc=0.0.0.0
net_dns_secondary_address&3dc=0.0.0.0
net_dns_parallel_search_mode&3d0=0
# Dynamic Network Configuration
net_isp_dhcp_enable&3dc=1
net_isp_pppoe_enable&3dc=0
net_isp_user_name&3dc=
net_isp_password&3dc=
net_isp_dhcp_discover_duration&3d0=1
net_isp_connect_on_demand_enable&3d0=0
net_isp_connect_on_demand_interval&3d0=0
net_isp_keep_alive_enable&3d0=0
net_isp_keep_alive_interval&3d0=0
net_isp_reconnect_on_link_loss&3d0=0
net_isp_save_as_assigned&3f0=0
# Remote Configuration Access
ata_web_external_server_enable&3f0=1
ata_web_internal_server_enable&3f0=1
ata_web_server_port&3f0=0
ata_web_server_language&3f0=0
ata_telnet_server_enable&3f0=1
ata_telnet_server_port&3f0=0
ata_ftp_server_enable&3f0=1
ata_ftp_server_port&3f0=0
# NAT Transversal Parameters
nat_stun_enable&3dc=1
nat_stun_dns_lookup_mode&3d0=0
nat_stun_server_domain_name&3dc=
nat_stun_symmetric_deterministic_enable&3dc=1
nat_turn_enable&3dc=0
nat_turn_server_domain_name&3dc=
nat_ice_enable&3f0=0
# Update Parameters
ata_local_update_enable&13f0=0
ata_local_update_domain_name&3f0=
ata_dhcp_update_enable&3c0=1
ata_update_domain_name&3fc=update.dktcomega.com:5070
ata_recovery_domain_name&300=recovery.dktcomega.com:5070
ata_finalize_domain_name&300=finalize.dktcomega.com:5070
ata_email_domain_name&300=email.dktcomega.com
ata_options_domain_name&300=options.dktcomega.com
ata_lcr_domain_name&300=lcr.dktcomega.com
ata_configuration_update_enable&3c0=0
ata_configuration_update_on_reset&3c0=0
ata_configuration_update_from_sip&3c0=0
ata_configuration_recover_enable&3c0=0
ata_configuration_request_message&3c0=
ata_configuration_success_message&3c0=Configuration update successful
ata_configuration_failed_message&3c0=Configuration update failed
```

```
ata_configuration_update_periodic_delay&3c0=3600
ata_configuration_update_random_delay&3c0=240
ata_configuration_update_error_retry_delay&3c0=120
ata_firmware_update_enable&3fc=0
ata_firmware_update_on_reset&3c0=0
ata_firmware_recovery_enable&3c0=0
ata_firmware_request_message&3c0=
ata_firmware_success_message&3c0=Firmware update successful
ata_firmware_failed_message&3c0=Firmware update failed
ata_firmware_update_periodic_delay&3c0=86400
ata_firmware_update_random_delay&3c0=240
ata_firmware_update_error_retry_delay&3c0=120
# ATA Maintenance
ata_help_url&3c0=help.html
ata_logo_url&3c0=atalogo.jpg
net_syslog_enable&3c0=0
net_syslog_server&3c0=
net_debug_enable&3c0=0
net_debug_server&3c0=
net_debug_level_ata&3c0=7
net_debug_level_sip&3c0=307
net_debug_level_mgcp&3c0=307
net_debug_level_net&3c0=7
net_debug_level_omc&3c0=7
net_debug_level_pmp&3c0=7
# System Identification
ata_copyright_notice&12a0=ATA Ver 5.04 (C) 1994-2008 DKTCOMEGA A/S
ata_manufacturer&12a0=DKT
ata_model_number&12a0=ATA2
ata_serial_number&12a0=3108
ata_hardware_revision&12a0=000
ata_boot_rom_revision&12a0=5.03
ata_firmware_revision&12a0=5.04
ata_configuration_revision&12a0=1.00.00
ata_processor_chip_id&1200=
ata_processor_die_id&1200=
net_hardware_mac_address&12a0=
net_unique_device_id&12a0=
#ata_processor_chip_id&1200=bf527
#ata_processor_die_id&1200=b0c090220b980c3989db2276c89d0000
#net_hardware_mac_address&12a0=00:50:c2:32:71:6c
#net_unique_device_id&12a0=DKT_ATA_0050c232716c
ata_system_info_1&300=
ata_system_info_2&300=
ata_system_info_3&300=
ata_system_info_4&300=
ata_system_info_5&300=
# VoIP Account 1 Information
voip_provider_1&3dc=
_voip_provider_1.provider_name&3fc=
_voip_provider_1.provider_type&3fc=1
_voip_provider_1.distinctive_ring_type&3fc=1
_voip_provider_1.dialing_prefix&3dc=
_voip_provider_1.preferred_audio_codecs&23fc=
_voip_provider_1.incoming_mode&3d0=0
_voip_provider_1.group_line_1_enable&3d0=1
_voip_provider_1.group_line_2_enable&3d0=1
_voip_provider_1.use_outbound_proxy&3d0=0
_voip_provider_1.dns_lookup_mode&3d0=0
_voip_provider_1.display_name&23fc=
```

```
_voip_provider_1.user_name&3fc=
_voip_provider_1.domain_name&3fc=
_voip_provider_1.auth_user_name&23fc=
_voip_provider_1.auth_domain_name&23fc=
_voip_provider_1.auth_user_password&3fc=
_voip_provider_1.proxy_domain_name&3fc=
_voip_provider_1.register_domain_name&3fc=
_voip_provider_1.reregister_interval&23fc=120
_voip_provider_1.subscription_domain_name&23fc=
_voip_provider_1.resubscribe_interval&23fc=0
# VoIP Account 2 Information
voip_provider_2&3dc=
_voip_provider_2.provider_name&3fc=
_voip_provider_2.provider_type&3fc=0
_voip_provider_2.distinctive_ring_type&3fc=0
_voip_provider_2.dialing_prefix&3dc=
_voip_provider_2.preferred_audio_codecs&23fc=
_voip_provider_2.incoming_mode&3d0=0
_voip_provider_2.group_line_1_enable&3d0=1
_voip_provider_2.group_line_2_enable&3d0=1
_voip_provider_2.use_outbound_proxy&3d0=0
_voip_provider_2.dns_lookup_mode&3d0=0
_voip_provider_2.display_name&23fc=
_voip_provider_2.user_name&3fc=
_voip_provider_2.domain_name&3fc=
_voip_provider_2.auth_user_name&23fc=
_voip_provider_2.auth_domain_name&23fc=
_voip_provider_2.auth_user_password&3fc=
_voip_provider_2.proxy_domain_name&3fc=
_voip_provider_2.register_domain_name&3fc=
_voip_provider_2.reregister_interval&23fc=120
_voip_provider_2.subscription_domain_name&23fc=
_voip_provider_2.resubscribe_interval&23fc=120
# VoIP Account 3 Information
voip_provider_3&3dc=
_voip_provider_3.provider_name&3fc=
_voip_provider_3.provider_type&3fc=0
_voip_provider_3.distinctive_ring_type&3fc=0
_voip_provider_3.dialing_prefix&3dc=
_voip_provider_3.preferred_audio_codecs&23fc=
_voip_provider_3.incoming_mode&3d0=0
_voip_provider_3.group_line_1_enable&3d0=1
_voip_provider_3.group_line_2_enable&3d0=1
_voip_provider_3.use_outbound_proxy&3d0=0
_voip_provider_3.dns_lookup_mode&3d0=0
_voip_provider_3.display_name&23fc=
_voip_provider_3.user_name&3fc=
_voip_provider_3.domain_name&3fc=
_voip_provider_3.auth_user_name&23fc=
_voip_provider_3.auth_domain_name&23fc=
_voip_provider_3.auth_user_password&3fc=
_voip_provider_3.proxy_domain_name&3fc=
_voip_provider_3.register_domain_name&3fc=
_voip_provider_3.reregister_interval&23fc=120
_voip_provider_3.subscription_domain_name&23fc=
_voip_provider_3.resubscribe_interval&23fc=120
# VoIP Account 4 Information
voip_provider_4&3dc=
_voip_provider_4.provider_name&3fc=
_voip_provider_4.provider_type&3fc=0
```

```
_voip_provider_4.distinctive_ring_type&3fc=0
_voip_provider_4.dialing_prefix&3dc=
_voip_provider_4.preferred_audio_codecs&23fc=
_voip_provider_4.incoming_mode&3d0=0
_voip_provider_4.group_line_1_enable&3d0=1
_voip_provider_4.group_line_2_enable&3d0=1
_voip_provider_4.use_outbound_proxy&3d0=0
_voip_provider_4.dns_lookup_mode&3d0=0
_voip_provider_4.display_name&23fc=
_voip_provider_4.user_name&3fc=
_voip_provider_4.domain_name&3fc=
_voip_provider_4.auth_user_name&23fc=
_voip_provider_4.auth_domain_name&23fc=
_voip_provider_4.auth_user_password&3fc=
_voip_provider_4.proxy_domain_name&3fc=
_voip_provider_4.register_domain_name&3fc=
_voip_provider_4.reregister_interval&23fc=120
_voip_provider_4.subscription_domain_name&23fc=
_voip_provider_4.resubscribe_interval&23fc=120
# VoIP Provider Defaults
voip_default_display_name&3e0=
voip_default_user_name&3e0=
voip_provider_default_line_1&3c0=1
voip_provider_alternate_line_1&3c0=0
voip_provider_default_line_2&3c0=1
voip_provider_alternate_line_2&3c0=0
# Audio Settings
voip_preferred_audio_codecs&3e0=18 0 8 109
voip_silence_suppression_enable&3e0=0
voip_echo_canceller_enable&3e0=1
voip_echo_canceller_mode&3e0=2
voip_echo_canceller_tail_length&3e0=16
voip_fax_processing_mode&3e0=0
voip_dtmf_transmit_method&3e0=0
# RTP Protocol Parameters
rtp_port_minimum&3e0=1234
rtp_port_maximum&3e0=65535
rtp_public_external_ip_address&3e0=0.0.0.0
rtp_public_external_port_min&3e0=0
rtp_tos_value&3e0=68
rtp_packet_duration&3e0=30
rtp_stream_duration&3e0=20
rtp_session_timeout_interval&3e0=900
rtp_jitter_buffer_start_depth&3e0=20
rtp_jitter_buffer_minimum_depth&3e0=20
# SDP Protocol Parameters
sdp_session_name&3e0=-
sdp_session_owner&3e0=DKT
sdp_ignore_stun&3e0=1
# SDP Audio Codec Names
sdp_g711u_codec_name&3e0=PCMU/8000
sdp_g711a_codec_name&3e0=PCMA/8000
sdp_cn_codec_name&3e0=CN
sdp_g729_codec_name&3e0=G729/8000
sdp_g729b_codec_name&3e0=G729B/8000
sdp_t38_codec_name&3e0=T38/8000
sdp_NSE_codec_name&3e0=X-NSE/8000
sdp_AVT_codec_name&3e0=telephone-event/8000
# SDP Audio Codec Dynamic Code Points
sdp_g711u_codec_dyn_pt&3e0=0
```

```
sdp_g711a_codec_dyn_pt&3e0=0
sdp_cn_codec_dyn_pt&3e0=0
sdp_g729_codec_dyn_pt&3e0=0
sdp_g729b_codec_dyn_pt&3e0=109
sdp_t38_codec_dyn_pt&3e0=108
sdp_NSE_codec_dyn_pt&3e0=100
sdp_AVT_codec_dyn_pt&3e0=101
# T.38 Fax Parameters
t38_fax_version&3e0=0
t38_fax_processing_rate&3e0=5
t38_fax_redundancy_level&3e0=1
t38_fax_fill_bit_removal&3e0=0
t38_fax_transcoding_mmr&3e0=0
t38_fax_transcoding_jbig&3e0=0
t38_fax_rate_management&3e0=0
t38_fax_max_buffer&3e0=512
t38_fax_max_datagram&3e0=200
t38_fax_udp_ec&3e0=0
t38_vendor_info&3e0=
# SIP Protocol Parameters
sip_user_agent&3e0=DKT 5.04
sip_require_user_name&3c0=0
sip_local_port&3e0=5060
sip_public_external_ip_address&3e0=0.0.0.0
sip_public_external_sip_port&3e0=0
sip_tos_value&3e0=68
sip_accept_language_string&3e0=
sip_send_response_to_src_port&3c0=0
sip_max_forwards&3e0=70
sip_ringing_retransmit&3c0=1
sip_use_nat_discovery&3e0=1
sip_use_received_via_info&3c0=0
sip_nat_keep_alive_enable&3c0=0
sip_nat_keep_alive_interval&3c0=15
sip_nat_keep_alive_domain_name&3c0=
sip_nat_keep_alive_message&3c0=
sip_prack_enable&3c0=0
# SIP Response Codes
sip_response_code_sit1&3c0=0
sip_response_code_sit2&3c0=0
sip_response_code_sit3&3c0=0
sip_response_code_sit4&3c0=0
sip_response_code_try_backup&3c0=0
sip_response_code_retry_registration&3c0=30
# SIP Distinctive Ring Names
sip_distinctive_ring_names_&3c0=
_sip_distinctive_ring_names_1&3c0=Belcore-r1
_sip_distinctive_ring_names_2&3c0=Belcore-r2
_sip_distinctive_ring_names_3&3c0=Belcore-r3
_sip_distinctive_ring_names_4&3c0=Belcore-r4
_sip_distinctive_ring_names_5&3c0=Belcore-r5
_sip_distinctive_ring_names_6&3c0=Belcore-r6
_sip_distinctive_ring_names_7&3c0=Belcore-r7
_sip_distinctive_ring_names_8&3c0=Belcore-r8
# SIP Protocol Timers
sip_timer_invite_expires&3c0=180
sip_timer_reinvite_expires&3c0=180
sip_timer_registration_min&3c0=1
sip_timer_registration_max&3c0=7200
sip_timer_registration_retry&3c0=30
```

```
sip_timer_no_answer_duration&3c0=300
sip_timer_reregister_interval&3c0=0
sip_session_timer&3c0=1800
# SIP Server Configuration
sip_allow_incoming_subscription&3c0=0
sip_subscribe_authentication&3c0=0
sip_incoming_resubscribe_interval&3c0=3600
sip_invite_authentication&3c0=0
sip_bye_authentication&3c0=0
sip_notify_authentication&3c0=0
sip_incoming_auth_user_name&3c0=
sip_incoming_auth_realm&3c0=
sip_incoming_auth_password&3c0=
# Voice and Tone Parameters
ipbx_voice_rx_gain&3f0=0
ipbx_voice_tx_gain&3f0=0
ipbx_tone_gain&3f0=0
ipbx_tone_max&3c0=-12
dtmf_low_tone_gain&3c0=-9
dtmf_high_tone_gain&3c0=-7
dtmf_tone_on_time&3c0=80
dtmf_tone_off_time&3c0=80
dtmf_detect_abcd&3c0=1
dtmf_generate_abcd&3c0=1
dtmf_pad_duration&3c0=100
dtmf_wait_duration&3c0=50
dtmf_playout_min_duration&3c0=100
# Timers
ipbx_brief_pause_duration&3c0=50
ipbx_initial_dial_duration&3c0=1500
ipbx_warm_line_duration&3c0=400
ipbx_interdigit_duration&3c0=500
ipbx_dialing_duration&3c0=1000
ipbx_hangup_disconnect_duration&3c0=85
ipbx_hangup_silence_duration&3c0=1000
ipbx_pause_wait_duration&3c0=300
ipbx_timeout_tone_duration&3c0=6000
ipbx_timeout_pause_duration&3c0=100
ipbx_timeout_disconnect_duration&3c0=85
ipbx_timeout_warning_duration&3c0=0
ipbx_timeout_hold_duration&3c0=1000
ipbx_timeout_hold_drop_duration&3c0=6000
ipbx_timeout_no_answer_drop_duration&3c0=120
ipbx_no_answer_duration&3c0=20
ipbx_call_back_duration&3c0=1800
ipbx_call_back_retry_duration&3c0=30
ipbx_call_back_ring_wait_duration&3c0=1
ipbx_message_waiting_refresh_duration&3c0=1800
ipbx_hookflash_maximum&3c0=900
ipbx_hookflash_minimum&3c0=100
ipbx_hookflash_delay&3c0=200
ipbx_answer_hangup_delay&3c0=0
# Other
ipbx_line_concurrent_line_count&3e0=2
ipbx_line_concurrent_voip_count&3e0=2
ipbx_epoch_clock_limit&3c0=16000
ipbx_hook_debounce&3c0=10
ipbx_hookflash_enable&3c0=1
# Call Progress Tones
ipbx_initial_dial_tone&3c0=1 0 0 425
```

```
ipbx_alternate_dial_tone&3c0=1 0 0 400 -16
ipbx_secondary_dial_tone&3c0=2 0 0 420 -19 520 -19
ipbx_stuttered_dial_tone&3c0=2 7 0 350 -19 440 -19 100 110 100 110 100 110 0
ipbx_message_wait_dial_tone&3c0=2 2 0 350 -19 440 -19 160 160
ipbx_call_forward_dial_tone&3c0=2 3 0 350 -19 440 -19 250 400 0
ipbx_pre_ringback_tone&3c0=4 -8 0 440 -16 494 -19 523 -19 587 -19 340 160 340
160 340 160 340 160
ipbx_ringback_tone&3c0=2 2 0 440 -19 480 -19 2000 4000
ipbx_call_waiting_tone_default&3c0=1 2 0 440 -16 300 9700
ipbx_call_station_call_waiting_tone_default&3c0=1 2 0 440 -16 300 9700
ipbx_call_holding_tone&3c0=1 4 0 1200 -16 100 200 100 -1
ipbx_call_disconnect_tone&3c0=2 2 0 480 -19 620 -19 500 500
ipbx_call_conference_tone&3c0=1 2 0 350 -16 100 15000
ipbx_busy_tone&3c0=2 2 0 480 -19 620 -19 500 500
ipbx_reorder_tone&3c0=2 2 0 480 -19 620 -19 250 250
ipbx_off_hook_warning_tone&3c0=4 2 0 1400 11 2050 11 2450 11 2600 11 100 100
ipbx_sit1_tone&3c0=3 -6 0 985 -16 1428 -16 1777 -16 330 5 330 5 330 1000
ipbx_sit2_tone&3c0=3 -6 0 914 -16 1371 -16 1777 -16 330 5 330 5 330 1000
ipbx_sit3_tone&3c0=3 -6 0 985 -16 1428 -16 1777 -16 380 5 380 5 380 1000
ipbx_sit4_tone&3c0=3 -6 0 914 -16 1371 -16 1777 -16 380 5 380 5 380 1000
ipbx_prompt_tone&3c0=2 0 0 520 -19 620 -19
ipbx_confirm_tone&3c0=1 2 0 600 -16 400 0
ipbx_input_error_tone&3c0=2 2 0 480 -19 620 -19 250 250
ipbx_number_error_tone&3c0=2 2 0 480 -19 620 -19 250 250
# Standard Ringing Patterns
ipbx_call_ring_default&3f0=20 2 0 2000 4000
ipbx_call_station_ring_default&3f0=20 2 0 1000 3000
ipbx_call_holding_rering&3f0=20 2 0 500 0
ipbx_call_back_ring&3f0=20 2 0 1500 0
ipbx_call_back_ring_splash&3f0=20 2 0 700 0
ipbx_call_forward_ring_splash&3f0=20 2 0 500 0
ipbx_message_waiting_ring_splash&3f0=20 2 0 500 0
# Distinctive Ringing Patterns
ipbx_distinctive_ring_1&3f0=20 2 0 2000 4000
ipbx_distinctive_ring_2&3f0=20 4 0 1000 1000 1000 3000
ipbx_distinctive_ring_3&3f0=20 6 0 300 200 1000 200 300 4000
ipbx_distinctive_ring_4&3f0=20 4 0 800 400 800 4000
ipbx_distinctive_ring_5&3f0=20 4 0 400 200 400 2000
ipbx_distinctive_ring_6&3f0=20 2 0 1000 3000
ipbx_distinctive_ring_7&3f0=20 4 0 300 200 1500 2000
ipbx_distinctive_ring_8&3f0=20 4 0 800 400 800 2000
# Distinctive Call Waiting Patterns
ipbx_call_waiting_tone_1&3f0=1 2 0 440 -16 300 9700
ipbx_call_waiting_tone_2&3f0=1 6 0 440 -16 100 20 100 20 100 9660
ipbx_call_waiting_tone_3&3f0=1 4 0 440 -16 100 100 100 9700
ipbx_call_waiting_tone_4&3f0=1 6 0 440 -16 100 100 100 100 100 9500
ipbx_call_waiting_tone_5&3f0=1 2 0 620 -16 300 9700
ipbx_call_waiting_tone_6&3f0=1 6 0 620 -16 100 20 100 20 100 9660
ipbx_call_waiting_tone_7&3f0=1 4 0 620 -16 100 100 100 9700
ipbx_call_waiting_tone_8&3f0=1 6 0 620 -16 100 100 100 100 100 9500
# SLAC Configuration
slac_port_impedance&3c0=0
slac_port_rx_gain&3c0=-3
slac_port_tx_gain&3c0=2
slac_audio_clamp_duration&3c0=100
slac_caller_id_type_1_mode&3c0=1
slac_caller_id_type_2_mode&3c0=1
slac_message_waiting_mode&3c0=1
slac_ring_type&3c0=0
slac_ring_frequency&3c0=25
```

```
slac_ring_transition&3c0=15
slac_ring_amplitude&3c0=85
slac_ring_bias&3c0=0
slac_message_waiting_type&3c0=0
slac_message_waiting_frequency&3c0=25
slac_message_waiting_transition&3c0=15
slac_message_waiting_amplitude&3c0=50
slac_message_waiting_bias&3c0=0
slac_dtmf_caller_id_start_code&3c0=0
slac_dtmf_caller_id_end_code&3c0=2
slac_dtmf_caller_id_polarity_reversal&3c0=0
# SLAC Command Strings
slac_initialization_commands&3c0=100
slac_impedance_commands_1&3c0=ca,40ed,98,3c,aa,32,ab,52,64,aa,a3,b2,40bc,9a,a
2,ba,a6,9f,4001,8a,0,f0,24,b0,33,a2,53,2c,71,d4,0,3d,31,4026,88,15,10,13,3c,2b
,b3,4b,2d,32,de,33,40a5,82,0,4002,80,b3,4011,86,3a,42,a1,3b,1d,24,b8,7a,87,a4,f
b,9f,a9,40f0,96,2e,4001,100
slac_impedance_commands_2&3c0=ca,4008,98,23,aa,32,ab,a4,b4,7d,a3,34,40ac,9a,
a4,ba,57,9f,4001,8a,7d,d0,42,a0,31,b3,e2,bd,b3,25,22,2d,24,4016,88,2b,20,22,
3b,44,13,24,1c,33,a6,13,40b6,82,0,4002,80,b3,4011,86,bd,42,51,22,13,b3,a8,f2,b6
,b4,ea,8f,a2,40f0,96,2e,4001,100
slac_impedance_commands_3&3c0=ca,4000,98,7a,b9,a2,d3,23,32,ab,33,3a,40dc,9a,2c,
a2,a3,22,40d0,8a,42,11,71,b0,13,a4,51,bc,22,2c,d5,26,e4,4087,88,14,20,36,23,31,
ba,7a,a7,c7,cc,0,4016,82,0,4002,80,b3,4011,86,f5,5b,a1,ae,1c,23,b2,3b,24,a5,4a,
c4,2c,4040,96,b2,40d0,100
slac_impedance_commands_4&3c0=ca,4006,98,3b,4c,ad,bb,aa,8f,a3,24,2a,40b7,9a,f
d,b2,25,4d,4001,8a,c3,c0,23,a0,c3,45,31,37,22,35,c3,cc,31,40e5,88,32,20,23,b9
,c2,41,3a,b9,c3,b2,12,402c,82,0,4002,80,b3,4011,86,aa,49,80,2a,c,23,23,7a,a4,2a
,52,c6,ea,4050,96,2d,4001,100
slac_impedance_commands_5&3c0=ca,40dd,98,23,51,b2,32,2c,4c,3a,aa,f3,4024,9a,a2,
b2,a7,9f,4001,8a,3,f0,1c,10,12,b8,32,ac,13,15,22,ce,24,408f,88,2b,20,b4,2f,f2,
3b,6d,c3,b2,bc,c4,40a5,82,0,4002,80,b3,4011,86,b2,52,32,98,3,a1,aa,24,b3,ac,4c,
55,d3,4060,96,a5,40f1,100
slac_impedance_commands_6&3c0=ca,40e1,98,2b,31,bb,22,a3,7b,ab,3a,bb,4043,9a,bd,
42,97,9f,4001,8a,3,f0,1d,10,2c,e8,46,c3,c4,26,1c,be,13,408f,88,14,30,24,16,13,
2b,47,4,13,1d,3b,4026,82,0,4002,80,b3,4011,86,a2,5a,22,d4,1b,a1,cb,25,b3,2b,42,
b5,ca,4060,96,3b,40a1,100
slac_impedance_commands_7&3c0=ca,40ed,98,3c,aa,32,ab,52,64,aa,a3,b2,40bc,9a,a2
,ba,a6,9f,4001,8a,0,f0,14,b0,34,a2,32,ab,1c,54,e4,ac,24,40a5,88,15,10,b2,3c,1b
,b3,bb,2d,3a,ce,33,40a5,82,0,4002,80,b3,4011,86,42,5c,22,ac,1c,a2,c3,5a,a6,29,f
a,9f,4a,40f0,96,2e,4001,100
slac_impedance_commands_8&3c0=ca,40dd,98,db,a3,ba,32,36,a2,a9,f5,23,40ad,9a,53,
b2,a6,1f,4001,8a,e,e0,14,20,be,2a,bb,2a,1b,cc,a7,36,b3,405e,88,3a,10,48,75,d3,
aa,32,b3,5a,2c,33,40a4,82,0,4002,80,b3,4011,86,a2,53,32,4b,13,52,22,3b,b3,a2,42
,b4,a2,4050,96,a2,40a0,100
slac_impedance_commands_9&3c0=ca,40e2,98,ab,b1,ad,42,23,bb,a8,7a,ca,40c3,9a,cb,
a3,97,9f,4001,8a,3,f0,22,20,41,29,13,16,2b,c4,12,bd,1d,4097,88,3a,20,3d,c4,24,
aa,15,43,13,bc,31,4036,82,0,4002,80,b3,4011,86,b2,5a,22,c5,12,a1,e2,34,b4,c4,64
,97,39,40f0,96,2e,4001,100
slac_impedance_commands_10&3c0=ca,4008,98,23,aa,32,ab,a4,b4,7d,a3,34,40ac,9a,
a4,ba,57,9f,4001,8a,7d,d0,42,a0,23,14,41,bd,2d,25,32,2d,d4,4016,88,1b,20,23,
3b,37,13,15,ab,2c,37,31,40c6,82,0,4002,80,b3,4011,86,72,53,a1,42,1a,e2,b8,73,77
,39,fa,3f,ab,40f0,96,2e,4001,100
# Subscription Service Settings
ipbx_call_waiting_service&3e0=1
ipbx_caller_id_inbound_service&3e0=1
ipbx_caller_id_outbound_service&3e0=1
ipbx_call_waiting_caller_id_service&3e0=1
ipbx_call_back_service&3e0=1
ipbx_call_return_service&3e0=1
```

```
ipbx_speed_dial_service&3e0=1
ipbx_do_not_disturb_service&3e0=1
ipbx_block_anonymous_service&3e0=1
ipbx_call_forward_service&3e0=1
ipbx_busy_forward_service&3e0=1
ipbx_no_answer_forward_service&3e0=1
ipbx_priority_forward_service&3e0=1
ipbx_distinctive_ring_service&3e0=1
ipbx_disturb_accept_service&3e0=1
ipbx_blocked_number_service&3e0=1
ipbx_outgoing_block_service&3e0=1
ipbx_forward_last_call_service&3e0=1
ipbx_distinctive_ring_last_call_service&3e0=1
ipbx_disturb_accept_last_call_service&3e0=1
ipbx_block_last_call_service&3e0=1
ipbx_three_way_calling_service&3e0=1
ipbx_three_way_conference_service&3e0=1
ipbx_attended_transfer_service&3e0=1
ipbx_unattended_transfer_service&3e0=1
ipbx_message_waiting_service&3e0=1
ipbx_visual_message_waiting_service&3e0=1
ipbx_remote_feature_code_service&3e0=0
ipbx_default_feature_code_service&3e0=0
# Port Configuration
ipbx_line_1_enable&3e0=1
ipbx_line_2_enable&3e0=1
ipbx_line_1_number&3e0=L1
ipbx_line_2_number&3e0=L2
ipbx_line_1_name&3e0=
ipbx_line_2_name&3e0=
# Operating Mode
ipbx_mode&3f0=1
ipbx_voip_primary_provider_unavailable&3f0=0
ipbx_voip_no_provider_available&3f0=1
ipbx_pstn_not_available&3f0=2
ipbx_dial_direct&3f0=3
ipbx_dial_after_8&3f0=2
ipbx_dial_after_9&3f0=1
ipbx_dial_after_pound_8&3f0=3
ipbx_dial_after_pound_9&3f0=3
ipbx_dial_speed_dial&3f0=1
ipbx_input_pattern_voip&3f0=[3469]11|*xx|**p2r*x|1900r7x!|976r4!|1800r7x|[^1]
r7x|1r3x[^1]r6x|1010Se#e*p2r*x|0Se#e*p2r*x
ipbx_input_pattern_pstn&3f0=911
ipbx_hot_line_dialing&3e0=0
ipbx_warm_line_dialing&3e0=0
ipbx_hotwarm_dial_string&3e0=
ipbx_party_line_enable&3e0=0
ipbx_polarity_dialing&3e0=1
ipbx_polarity_dial_done&3e0=1
ipbx_polarity_connect&3e0=1
ipbx_polarity_answer&3e0=1
ipbx_polarity_idle&3e0=1
# Speed Dials
ipbx_speed_dial_array_&3df=
_ipbx_speed_dial_array_1&3df=
_ipbx_speed_dial_array_2&3df=
_ipbx_speed_dial_array_3&3df=
_ipbx_speed_dial_array_4&3df=
_ipbx_speed_dial_array_5&3df=
```

```
_ipbx_speed_dial_array_6&3df=
_ipbx_speed_dial_array_7&3df=
_ipbx_speed_dial_array_8&3df=
_ipbx_speed_dial_array_9&3df=
_ipbx_speed_dial_array_10&3df=
_ipbx_speed_dial_array_11&3df=
_ipbx_speed_dial_array_12&3df=
_ipbx_speed_dial_array_13&3df=
_ipbx_speed_dial_array_14&3df=
_ipbx_speed_dial_array_15&3df=
_ipbx_speed_dial_array_16&3df=
_ipbx_speed_dial_array_17&3df=
_ipbx_speed_dial_array_18&3df=
_ipbx_speed_dial_array_19&3df=
_ipbx_speed_dial_array_20&3df=
_ipbx_speed_dial_array_21&3df=
_ipbx_speed_dial_array_22&3df=
_ipbx_speed_dial_array_23&3df=
_ipbx_speed_dial_array_24&3df=
_ipbx_speed_dial_array_25&3df=
_ipbx_speed_dial_array_26&3df=
_ipbx_speed_dial_array_27&3df=
_ipbx_speed_dial_array_28&3df=
_ipbx_speed_dial_array_29&3df=
_ipbx_speed_dial_array_30&3df=
ipbx_hot_warm_dial_string&3d3=
# Call Forwarding
ipbx_call_forward_enable&3df=0
ipbx_busy_forward_enable&3df=0
ipbx_no_answer_forward_enable&3df=0
ipbx_priority_forward_enable&3df=0
ipbx_call_forward_dial_string&3df=
ipbx_busy_forward_dial_string&3df=
ipbx_no_answer_forward_dial_string&3df=
ipbx_priority_forward_dial_string&3df=
ipbx_call_forward_list_&3df=
_ipbx_call_forward_list_1&3df=
_ipbx_call_forward_list_2&3df=
_ipbx_call_forward_list_3&3df=
_ipbx_call_forward_list_4&3df=
_ipbx_call_forward_list_5&3df=
_ipbx_call_forward_list_6&3df=
_ipbx_call_forward_list_7&3df=
_ipbx_call_forward_list_8&3df=
_ipbx_call_forward_list_9&3df=
_ipbx_call_forward_list_10&3df=
_ipbx_call_forward_list_11&3df=
_ipbx_call_forward_list_12&3df=
_ipbx_call_forward_list_13&3df=
_ipbx_call_forward_list_14&3df=
_ipbx_call_forward_list_15&3df=
_ipbx_call_forward_list_16&3df=
_ipbx_call_forward_list_17&3df=
_ipbx_call_forward_list_18&3df=
_ipbx_call_forward_list_19&3df=
_ipbx_call_forward_list_20&3df=
_ipbx_call_forward_list_21&3df=
_ipbx_call_forward_list_22&3df=
_ipbx_call_forward_list_23&3df=
_ipbx_call_forward_list_24&3df=
```

```
_ipbx_call_forward_list_25&3df=
_ipbx_call_forward_list_26&3df=
_ipbx_call_forward_list_27&3df=
_ipbx_call_forward_list_28&3df=
_ipbx_call_forward_list_29&3df=
_ipbx_call_forward_list_30&3df=
# Distinctive Ringing
ipbx_distinctive_ring_enable&3df=1
ipbx_distinctive_ring_list_&3df=
_ipbx_distinctive_ring_list_1&3df=
_ipbx_distinctive_ring_list_2&3df=
_ipbx_distinctive_ring_list_3&3df=
_ipbx_distinctive_ring_list_4&3df=
_ipbx_distinctive_ring_list_5&3df=
_ipbx_distinctive_ring_list_6&3df=
_ipbx_distinctive_ring_list_7&3df=
_ipbx_distinctive_ring_list_8&3df=
_ipbx_distinctive_ring_list_9&3df=
_ipbx_distinctive_ring_list_10&3df=
_ipbx_distinctive_ring_list_11&3df=
_ipbx_distinctive_ring_list_12&3df=
_ipbx_distinctive_ring_list_13&3df=
_ipbx_distinctive_ring_list_14&3df=
_ipbx_distinctive_ring_list_15&3df=
_ipbx_distinctive_ring_list_16&3df=
_ipbx_distinctive_ring_list_17&3df=
_ipbx_distinctive_ring_list_18&3df=
_ipbx_distinctive_ring_list_19&3df=
_ipbx_distinctive_ring_list_20&3df=
_ipbx_distinctive_ring_list_21&3df=
_ipbx_distinctive_ring_list_22&3df=
_ipbx_distinctive_ring_list_23&3df=
_ipbx_distinctive_ring_list_24&3df=
_ipbx_distinctive_ring_list_25&3df=
_ipbx_distinctive_ring_list_26&3df=
_ipbx_distinctive_ring_list_27&3df=
_ipbx_distinctive_ring_list_28&3df=
_ipbx_distinctive_ring_list_29&3df=
_ipbx_distinctive_ring_list_30&3df=
# Do Not Disturb
ipbx_do_not_disturb_mode&13df=0
ipbx_disturb_accept_enable&3df=0
ipbx_disturb_accept_list_&3df=
_ipbx_disturb_accept_list_1&3df=
_ipbx_disturb_accept_list_2&3df=
_ipbx_disturb_accept_list_3&3df=
_ipbx_disturb_accept_list_4&3df=
_ipbx_disturb_accept_list_5&3df=
_ipbx_disturb_accept_list_6&3df=
_ipbx_disturb_accept_list_7&3df=
_ipbx_disturb_accept_list_8&3df=
_ipbx_disturb_accept_list_9&3df=
_ipbx_disturb_accept_list_10&3df=
_ipbx_disturb_accept_list_11&3df=
_ipbx_disturb_accept_list_12&3df=
_ipbx_disturb_accept_list_13&3df=
_ipbx_disturb_accept_list_14&3df=
_ipbx_disturb_accept_list_15&3df=
_ipbx_disturb_accept_list_16&3df=
_ipbx_disturb_accept_list_17&3df=
```

```
_ipbx_disturb_accept_list_18&3df=
_ipbx_disturb_accept_list_19&3df=
_ipbx_disturb_accept_list_20&3df=
_ipbx_disturb_accept_list_21&3df=
_ipbx_disturb_accept_list_22&3df=
_ipbx_disturb_accept_list_23&3df=
_ipbx_disturb_accept_list_24&3df=
_ipbx_disturb_accept_list_25&3df=
_ipbx_disturb_accept_list_26&3df=
_ipbx_disturb_accept_list_27&3df=
_ipbx_disturb_accept_list_28&3df=
_ipbx_disturb_accept_list_29&3df=
_ipbx_disturb_accept_list_30&3df=
# Call Blocking
ipbx_block_anonymous_enable&3df=0
ipbx_blocked_number_enable&3df=0
ipbx_blocked_number_list_&3df=
_ipbx_blocked_number_list_1&3df=
_ipbx_blocked_number_list_2&3df=
_ipbx_blocked_number_list_3&3df=
_ipbx_blocked_number_list_4&3df=
_ipbx_blocked_number_list_5&3df=
_ipbx_blocked_number_list_6&3df=
_ipbx_blocked_number_list_7&3df=
_ipbx_blocked_number_list_8&3df=
_ipbx_blocked_number_list_9&3df=
_ipbx_blocked_number_list_10&3df=
_ipbx_blocked_number_list_11&3df=
_ipbx_blocked_number_list_12&3df=
_ipbx_blocked_number_list_13&3df=
_ipbx_blocked_number_list_14&3df=
_ipbx_blocked_number_list_15&3df=
_ipbx_blocked_number_list_16&3df=
_ipbx_blocked_number_list_17&3df=
_ipbx_blocked_number_list_18&3df=
_ipbx_blocked_number_list_19&3df=
_ipbx_blocked_number_list_20&3df=
_ipbx_blocked_number_list_21&3df=
_ipbx_blocked_number_list_22&3df=
_ipbx_blocked_number_list_23&3df=
_ipbx_blocked_number_list_24&3df=
_ipbx_blocked_number_list_25&3df=
_ipbx_blocked_number_list_26&3df=
_ipbx_blocked_number_list_27&3df=
_ipbx_blocked_number_list_28&3df=
_ipbx_blocked_number_list_29&3df=
_ipbx_blocked_number_list_30&3df=
# Outgoing Call Blocking
ipbx_outgoing_block_enable&3df=0
ipbx_outgoing_block_list_&3df=
_ipbx_outgoing_block_list_1&3df=
_ipbx_outgoing_block_list_2&3df=
_ipbx_outgoing_block_list_3&3df=
_ipbx_outgoing_block_list_4&3df=
_ipbx_outgoing_block_list_5&3df=
_ipbx_outgoing_block_list_6&3df=
_ipbx_outgoing_block_list_7&3df=
_ipbx_outgoing_block_list_8&3df=
_ipbx_outgoing_block_list_9&3df=
_ipbx_outgoing_block_list_10&3df=
```

```
_ipbx_outgoing_block_list_11&3df=
_ipbx_outgoing_block_list_12&3df=
_ipbx_outgoing_block_list_13&3df=
_ipbx_outgoing_block_list_14&3df=
_ipbx_outgoing_block_list_15&3df=
_ipbx_outgoing_block_list_16&3df=
_ipbx_outgoing_block_list_17&3df=
_ipbx_outgoing_block_list_18&3df=
_ipbx_outgoing_block_list_19&3df=
_ipbx_outgoing_block_list_20&3df=
_ipbx_outgoing_block_list_21&3df=
_ipbx_outgoing_block_list_22&3df=
_ipbx_outgoing_block_list_23&3df=
_ipbx_outgoing_block_list_24&3df=
_ipbx_outgoing_block_list_25&3df=
_ipbx_outgoing_block_list_26&3df=
_ipbx_outgoing_block_list_27&3df=
_ipbx_outgoing_block_list_28&3df=
_ipbx_outgoing_block_list_29&3df=
_ipbx_outgoing_block_list_30&3df=
# Caller Waiting/Caller ID
ipbx_call_waiting_enable&3df=1
ipbx_caller_id_inbound_enable&3df=1
ipbx_caller_id_outbound_enable&3df=1
ipbx_caller_id_waiting_enable&3df=0
# Message Waiting
ipbx_message_waiting&13e0=0
# Feature Code Assignments (55-99)
ipbx_fc_call_waiting_enable&3e0=55
ipbx_fc_call_waiting_disable&3e0=56
ipbx_fc_call_trace&3e0=57
ipbx_fc_call_waiting_caller_id_enable&3e0=58
ipbx_fc_call_waiting_caller_id_disable&3e0=59
ipbx_fc_blocked_number_enable&3e0=60
ipbx_fc_distinctive_ring_enable&3e0=61
ipbx_fc_caller_id_outbound_disable&3e0=62
ipbx_fc_priority_forward_enable&3e0=63
ipbx_fc_disturb_accept_enable&3e0=64
ipbx_fc_caller_id_inbound_enable&3e0=65
ipbx_fc_busy_number_redial&3e0=66
ipbx_fc_caller_id_outbound_enable_once&3e0=67
ipbx_fc_caller_id_outbound_disable_once&3e0=68
ipbx_fc_caller_redial&3e0=69
ipbx_fc_call_waiting_disable_once&3e0=70
ipbx_fc_call_waiting_enable_once&3e0=71
ipbx_fc_call_forward_enable&3e0=72
ipbx_fc_call_forward_disable&3e0=73
ipbx_fc_one_digit_speed_dial_program&3e0=74
ipbx_fc_two_digit_speed_dial_program&3e0=75
ipbx_fc_block_anonymous_enable&3e0=77
ipbx_fc_do_not_disturb_enable&3e0=78
ipbx_fc_do_not_disturb_disable&3e0=79
ipbx_fc_blocked_number_disable&3e0=80
ipbx_fc_distinctive_ring_disable&3e0=81
ipbx_fc_caller_id_outbound_enable&3e0=82
ipbx_fc_priority_forward_disable&3e0=83
ipbx_fc_disturb_accept_disable&3e0=84
ipbx_fc_caller_id_inbound_disable&3e0=85
ipbx_fc_busy_number_redial_cancel&3e0=86
ipbx_fc_block_anonymous_disable&3e0=87
```

```
ipbx_fc_hookflash_simulation&3e0=88
ipbx_fc_caller_redial_cancel&3e0=89
ipbx_fc_no_answer_forward_enable&3e0=92
ipbx_fc_no_answer_forward_disable&3e0=93
ipbx_fc_busy_forward_enable&3e0=94
ipbx_fc_busy_forward_disable&3e0=95
ipbx_fc_outgoing_block_enable&3e0=96
ipbx_fc_outgoing_block_disable&3e0=97
ipbx_fc_unattended_transfer&3e0=98
```

appendix 2 - wifi configuration file

```
#The following line must not be removed.
Default
WebInit=1
HostName=DKTCOMEGA
Login=*********
Password=*********
OperationMode=0
Platform=RT3050
wanConnectionMode=DHCP
wan_ipaddr=192.168.2.1
wan_netmask=255.255.255.0
wan_gateway=192.168.2.254
wan_primary_dns=168.95.1.1
wan_secondary_dns=168.95.192.1
wan_pppoe_user=pppoe_user
wan_pppoe_pass=pppoe_passwd
wan_l2tp_server=l2tp_server
wan_l2tp_user=l2tp_user
wan_l2tp_pass=l2tp_passwd
wan_l2tp_mode=0
wan_l2tp_ip=192.168.2.1
wan_l2tp_netmask=255.255.255.0
wan_l2tp_gateway=192.168.2.254
wan_pptp_server=pptp_server
wan_pptp_user=pptp_user
wan_pptp_pass=pptp_passwd
wan_pptp_mode=0
wan_pptp_ip=192.168.2.1
wan_pptp_netmask=255.255.255.0
wan_pptp_gateway=192.168.2.254
lan_ipaddr=192.168.1.250
lan_netmask=255.255.255.0
dhcpEnabled=0
dhcpStart=192.168.1.100
dhcpEnd=192.168.1.200
dhcpMask=255.255.255.0
dhcpPriDns=168.95.1.1
dhcpSecDns=168.95.192.1
dhcpGateway=192.168.1.250
dhcpLease=86400
stpEnabled=0
lltdEnabled=0
igmpEnabled=0
natEnabled=1
```

```
IPPortFilterEnable=0
IPPortFilterRules=
PortForwardEnable=0
PortForwardRules=
MacFilterEnable=0
MacFilterRules=
DefaultFirewallPolicy=1
DMZEnable=0
DMZIPAddress=
TZ=
NTPServerIP=
NTPSync=
DDNSProvider=
DDNS=
DDNSAccount=
DDNSPassword=
BssidNum=4
SSID1=DKTCOMEGA1
WirelessMode=9
TxRate=0;0;0;0
Channel=6
BasicRate=15
BeaconPeriod=100
DtimPeriod=1
TxPower=100
RxAckTimeout=32
DisableOLBC=0
BGProtection=0
TxAntenna=
RxAntenna=
TxPreamble=0
RTSThreshold=2347
FragThreshold=2346
TxBurst=1
PktAggregate=1
TurboRate=0
StaLimitationEnable=0
StaLimitationNum=0
WmmCapable=1;1;1;1
APAifsn=3;7;1;1
APCwmin=4;4;3;2
APCwmax=6;10;4;3
APTxop=0;0;94;47
APACM=0;0;0;0
BSSAifsn=3;7;2;2
BSSCwmin=4;4;3;2
BSSCwmax=10;10;4;3
BSSTxop=0;0;94;47
BSSACM=0;0;0;0
AckPolicy=0;0;0;0
APSDCapable=0
DLSCapable=0
NoForwarding=0;0;0;0
NoForwardingBTNBSSID=0
HideSSID=0;0;0;0
ShortSlot=1
AutoChannelSelect=0
SecurityMode=0
VLANEnable=0
VLANName=
```

DKTCOMEGA

```
VLANID=0;0;0;0
VLANPriority=0;0;0;0
WscConfMode=0
WscConfStatus=2
WscAKMP=1
WscConfigured=1
WscModeOption=0
WscActionIndex=9
WscPinCode=
WscRegResult=1
WscUseUPnP=1
WscUseUFD=0
WscSSID=DKTCOMEGAAP
WscKeyMGMT=WPA-EAP
WscConfigMethod=138
WscAuthType=1
WscEncrypType=1
WscNewKey=scaptest
IEEE8021X=0;0;0;0
IEEE80211H=0
CSPeriod=6
PreAuth=0;0;0;0
AuthMode=WPAPSK;OPEN;OPEN;OPEN
EncrypType=TKIP;NONE;NONE;NONE
RekeyInterval=3600
RekeyMethod=DISABLE
PMKCachePeriod=10
WPAPSK1=56655153
DefaultKeyID=2;1;1;1
Key1Type=0;0;0;0
Key1Str1=
Key2Type=0;0;0;0
Key2Str1=
Key3Type=0;0;0;0
Key3Str1=
Key4Type=0;0;0;0
Key4Str1=
HSCounter=0
HT_HTC=1
HT_RDG=1
HT_LinkAdapt=0
HT_OpMode=0
HT_MpduDensity=5
HT_EXTCHA=1
HT_BW=1
HT_AutoBA=1
HT_BADecline=0
HT_AMSDU=0
HT_BAWinSize=64
HT_GI=1
HT_STBC=1
HT_MCS=33;33;33;33
HT_PROTECT=1
HT_MIMOPS=3
HT_40MHZ_INTOLERANT=0
HT_TxStream=2
HT_RxStream=2
NintendoCapable=0
AccessPolicy0=0
AccessControlList0=
```

```
AccessPolicy1=0
AccessControlList1=
AccessPolicy2=0
AccessControlList2=
AccessPolicy3=0
AccessControlList3=
WdsEnable=0
WdsPhyMode=HTMIX;HTMIX;HTMIX;HTMIX
WdsEncrypType=NONE
WdsList=
WdsKey=
WirelessEvent=0
RADIUS_Server=0;0;0;0
RADIUS_Port=1812;1812;1812;1812
RADIUS_Key=DKTCOMEGA;DKTCOMEGA;DKTCOMEGA;DKTCOMEGA
RADIUS_Acct_Server=
RADIUS_Acct_Port=1813
RADIUS_Acct_Key=
session_timeout_interval=0
idle_timeout_interval=0
staWirelessMode=9
RemoteManagement=1
WAN_MAC_ADDR=00:0C:43:30:50:66

RFICType=5
TXPath=5
RXPath=1
SSID2=DKTCOMEGA2
SSID3=DKTCOMEGA3
SSID4=DKTCOMEGA4
WPAPSK2=12345678
Key1Str2=
Key2Str2=
Key3Str2=
Key4Str2=
WPAPSK3=12345678
Key1Str3=
Key2Str3=
Key3Str3=
Key4Str3=
WPAPSK4=12345678
Key1Str4=
Key2Str4=
Key3Str4=
Key4Str4=
FixedTxMode=HT;HT;HT;HT
MNGVLANID=
```

appendix 3 – dhcp settings

As an example we have used Linux Kubunto platform and installed the following component via adept

- dhcp3
- tftpd

Make sure that DHCP server has its unique static IP address settings, so it doesn't conflict with its own leasing of IP Addresses.
It is important that the DHCP server is properly configured, and that it responds to the DHCP options

requested by the CPE. Otherwise communication with the internal CPU of the CPE can't be obtained.
For more information about DHCP options in dhcp3, please refer to: http://pwet.fr/man/linux/formats/dhcp_options
To edit DHCP Server Setup for dhcp3, edit the DHCP setup configuration file:

```
sudo kate /etc/dhcp3/dhcpd.conf

# DHCP SECTION: insert the following
default-lease-time <SECONDS>;
# Ex: default-lease-time 600
max-lease-time <SECONDS>;
# Ex: max-lease-time 7200
# --------------FIRMWARE UPGRADE PART -----------------
class "Upgrade Firmware after boot loader upgrade" {
match if option vendor-class-identifier = "DKT_BF_firstboot";
filename = "dkt_fw_02_01.img";
}
# DHCP request in U-boot has got an option 43 field with bootloader/U-boot
software version information (ex. the text string "14" for revision 1.4). This
information is available from boot loader revision 2_00 and forward
---# --------------- END OF UPGRADE -------------------
# The following is needed in order for the CPE to download the configuration.
Remember to place this configuration file in TFTPBOOT directory. Remember to
assign correct eth interface, subnet/mask, IP address range, TFTP-server name
and bootfile-name below
subnet <Subnet> netmask <Subnet mask> #
Ex: subnet 192.168.1.0 netmask 255.255.255.0
{
   interface <Ethernet Interface>;
# Ex. interface eth0
   range <Min IP Address> <Max IP Address>;
# Ex: range 192.168.1.10 192.168.1.30

  option tftp-server-name "<TFTP Server IP Address>";
# Ex: option tftp-server-name "192.168.1.1"
  option bootfile-name "<Configuration_File_Name";
# Ex: option bootfile-name "cpe_settings.txt"
option broadcast-address <Broadcast IP Address>;
# Ex: option broadcast-address 192.168.1.255
option routers <Router IP Address>;
# Ex: option routers 192.168.1.1
server-name "<Server IP Address Name>";
# Ex: server-name "192.168.1.1"
option next-server <Server IP Address Name>;
# Ex: next-server 192.168.1.1
option subnet-mask <Subnet Mask>;
# Ex: option subnet-mask 255.255.255.0
}
```

To restart DHCP Server
Any change in the dchp configuration implies a server reset. For the DHCP server used for this purpose the following instruction is necessary:

```
sudo /etc/init.d/dhcp3-server restart
```

appendix 4 – tftp settings

After the DHCP server is configured a TFTP server should be configured, so firmware image and configuration file for the CPE can be downloaded correctly.
As an example we have used Linux tftpd and xinetd
The TFTP configuration file must be edited. And a tftpboot directory must be created in root and made accessible from CPEs

```
mkdir tftpboot
# creates tftpboot directory
chmod a+wrx tftpboot
# changes rights so directory is readable, writeable and executable from CPEs
sudo kate /etc/xinetd.d/tftp
# starts an editor where TFTP settings can be inserted
Insert the following:
service tftp
{
protocol            = udp
port          = 69
# CONFIGURATION FILE SECTION: insert the following
socket_type   = dgram
wait          = yes
user          = nobody
server        = /usr/sbin/in.tftpd
server_args   = /tftpboot
disable             = no
}
```

DKT COMEGA